THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1491.] LONDON, DECEMBER 8, 1891. [43RD YEAR. Price 6d.

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Guaranteed Free from Adulteration. **TORBAY PAINTS.**

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The Original "Torbay Paints"
As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.

Special Quotations to Gas Companies.

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This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

SELF-CONTAINED DUST-FUEL FURNACE.
MELDRUM'S PATENT.

Extract from the *Smethwick Telephone*, June 13, 1891.

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"The Manager [B. W. Smith, Esq.] reported that the adoption of MELDRUM'S PATENT FURNACES, he estimated, had resulted in a saving of 150 tons of Slack during the nine months they had been at work in the Boiler-House, and 360 tons of Slack during four months in the Retort-House; the fuel used in place of slack being the fine coke dust which formerly had to be carted or boated away at considerable expense."

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(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

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PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

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Messrs. COCKEY desire to draw the attention of Gas Engineers and Managers to their new form of GAS WASHER, which, by a recent patent, converts their HORIZONTAL Washer into one of a VERTICAL form.

The principle is the same as in the horizontal one, which has now been before the profession for a number of years, and where adopted is giving unqualified satisfaction.

The Washer is entirely automatic in its action, and does not therefore need any motive power—an advantage which will be apparent to all.

It is made in all sizes, from **25,000 TO 3,000,000 FEET PER DAY**; and Messrs. COCKEY invite inquiries, which shall have early attention.

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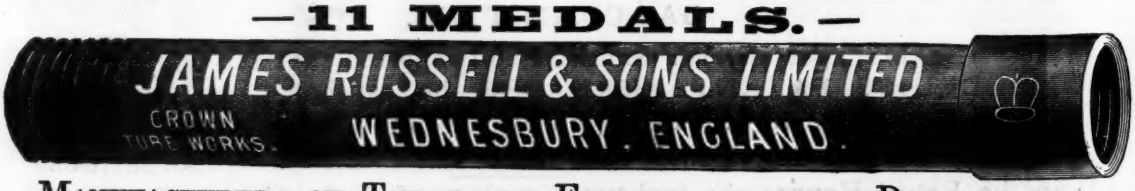

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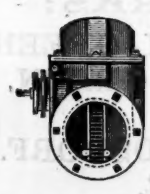

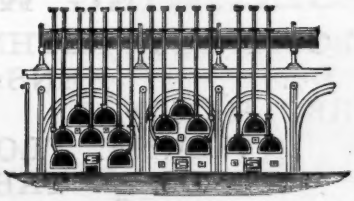

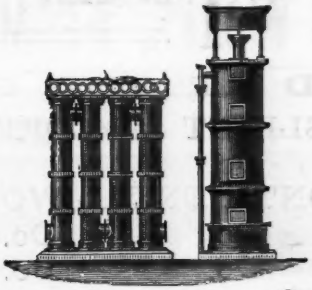

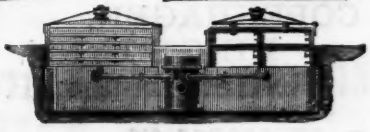

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DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

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CROSSLEY'S "OTTO" GAS-ENGINE.

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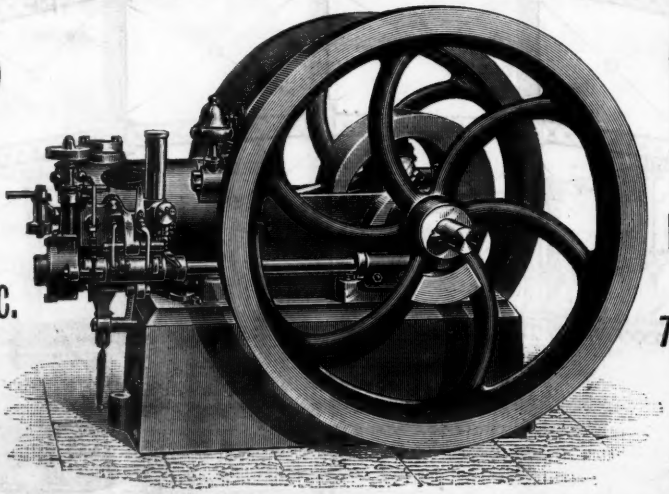

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MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

AVOID ACCIDENTS TO GASHOLDERS THROUGH FROST

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

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SPECIALTY OF GASHOLDERS

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GAS PLANT OF EVERY DESCRIPTION.

R. & J. DEMPSTER,

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MAKERS AND ERECTORS OF

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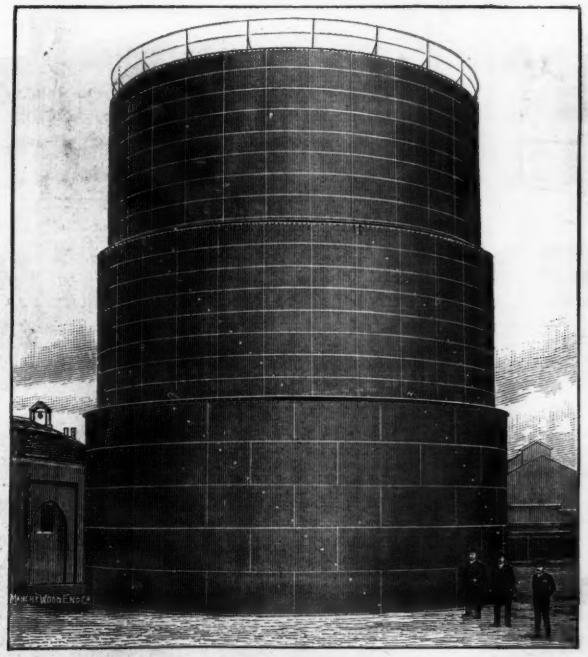
TOTAL WEIGHT REDUCED
from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED
to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED.
The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder recently erected, in a wrought-iron Tank, for the Birmingham Oxygen Company, at their Works, Saltley, Birmingham. The bottom of the Tank is fixed level with the ground, upon a concrete foundation.

COST OF PAINTING SAVED
for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE;
And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE
of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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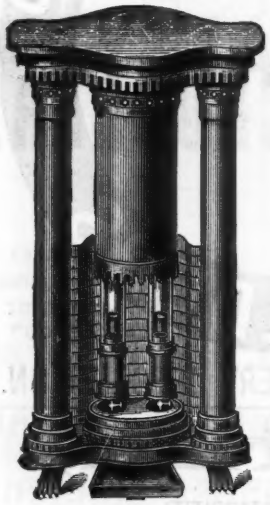

THE "SYPHON" (REGISTERED TITLE.)

(CLARK'S PATENT.)

Hygienic Gas-Heating Stoves

For Use Without a Flue.

NO FLUE REQUIRED. NO SMOKE. NO SMELL.
NO DIRT OR TROUBLE. NO DANGER.

All sulphurous Vapours are condensed inside the Stoves, and passed off as liquid into the tray beneath.

The "SYPHON" Hygienic Gas-Heating Stoves give a pure, equable, and agreeable heat, which can be graduated and sustained at the will of the user. They are so constructed that a moist or dry atmosphere is obtained at pleasure.

They are the Only Safe Stoves for use in Greenhouses, Conservatories, Bed-rooms, &c., and especially suitable for Halls, Sitting-Rooms, Offices, Shops, Schoolrooms, and Theatres.

Adopted by the principal Gas Companies throughout the Kingdom.

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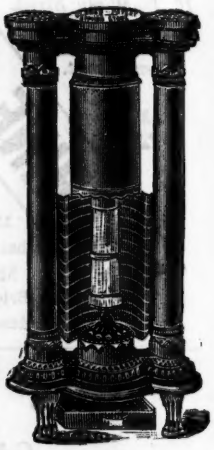

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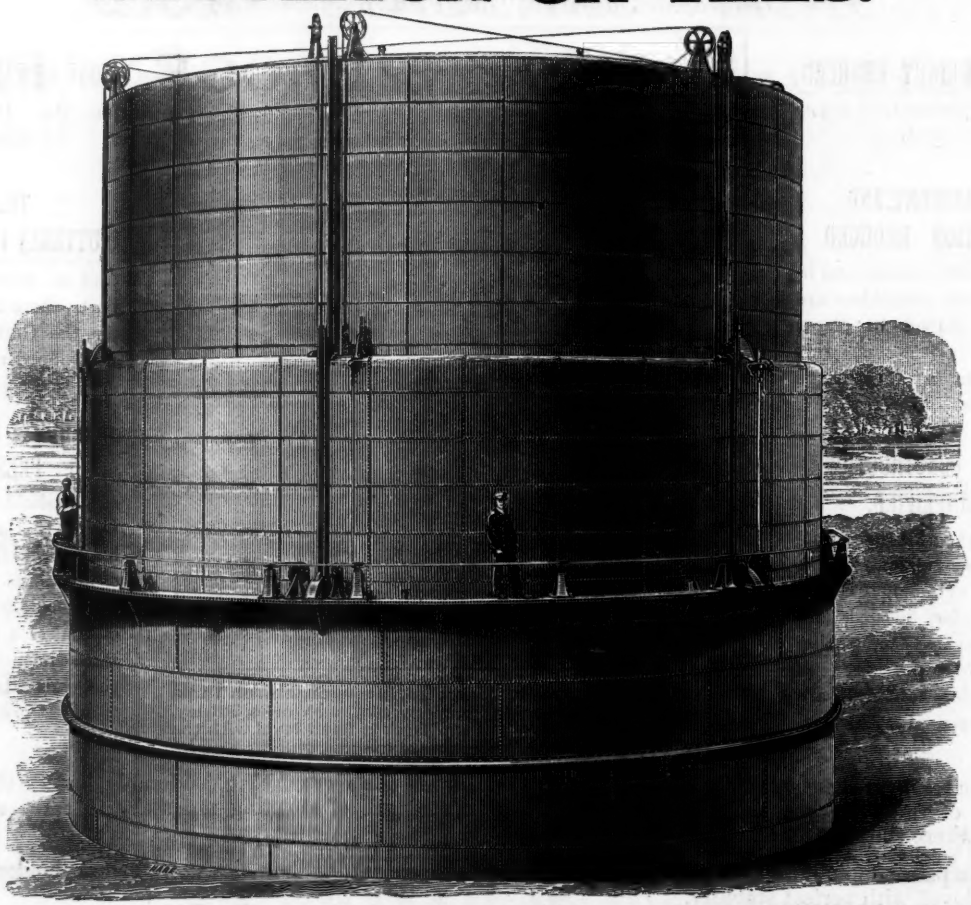

TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

KIRKHAM, HULETT, & CHANDLER,

LIMITED.

(SIDNEY HERSEY, Managing Director.) (J. CHANDLER, Engineer.)

PATENT

"STANDARD" WASHER-SCRUBBER.

430

of these Machines have now been supplied, and several are now in course of erection. These facts are given as evidence of the apparatus being the most efficient of any in the Market for the extraction of

AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

50 of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to **25** original pattern Machines.

Estimates furnished for Cost of altering original pattern Patent "STANDARD" WASHER-SCRUBBERS, or for the supply of New Machines, on application at the Company's Offices,

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R. LAIDLAW & SON.

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

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A LARGE STOCK OF GAS AND WATER METERS ALWAYS READY FOR IMMEDIATE DELIVERY OR SHIPMENT.

STATION METERS,

WITH ROUND OR SQUARE CASES.

PRESSURE REGISTERS.

Improved Station and Exhauster Governors.

Lamp Pillars,

WITH EITHER WET OR DRY METERS FOR AVERAGE METER SYSTEM.

Experimental Hourly-Rate and Test Meters.

Experimental Apparatus.

Pressure Gauges.

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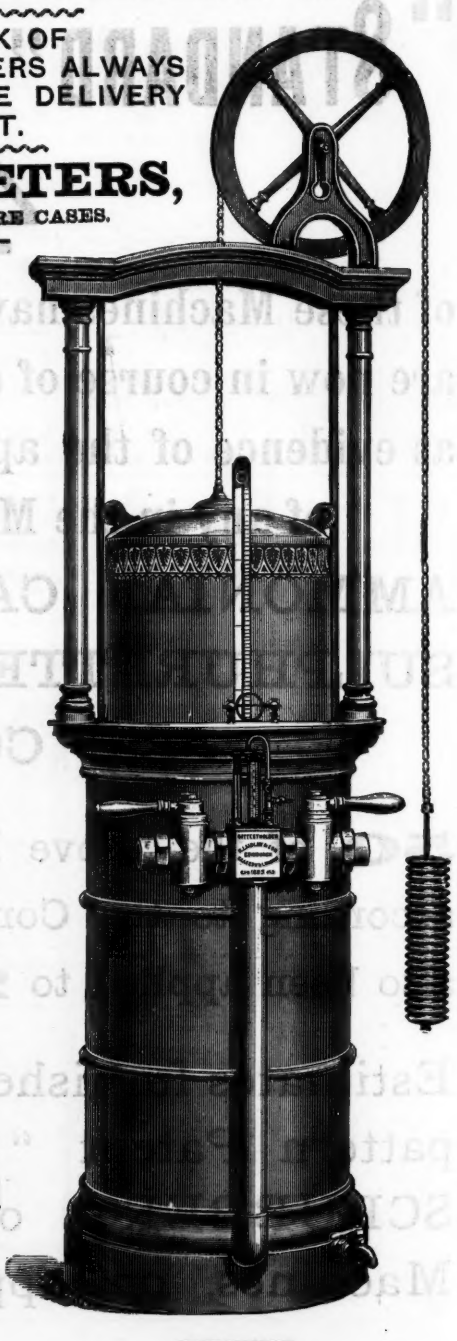
Siemens' Patent Water Meters, and Gas Apparatus and Fittings.



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STANDARD TEST-HOLDERS AND TEST-METERS FOR OFFICIAL INSPECTORS, &c.,

AUTHORIZED BY THE BOARD OF TRADE STANDARDS DEPARTMENT.

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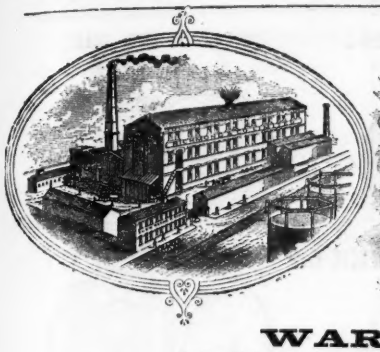


GAS COOKING RANGES
Richmond & Co. Limited
GAS FIRES
Heating Stoves
WATER HEATERS
BOILING BURNERS
GAS ENGINEERS

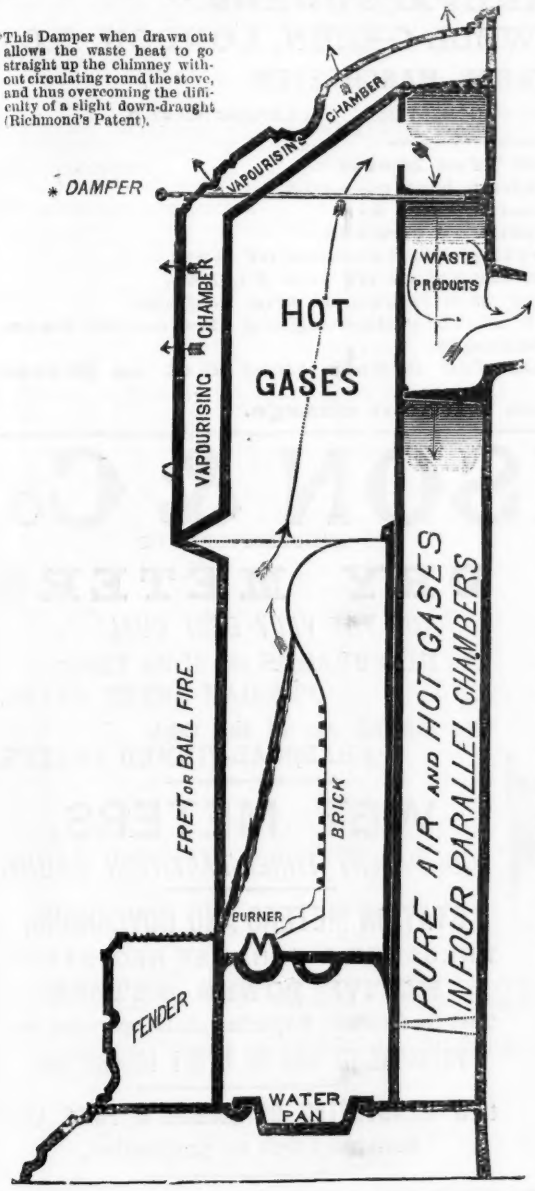
WARRINGTON & LONDON.

Sole Agents for Webb's Lamps. **E. W. T. Richmond, Managing Director.**

Telegrams, "Gastoves," Warrington. *Terms, Cash Monthly.*

This Section applies to both No. 480 and No. 470 Series.

*This Damper when drawn out allows the waste heat to go straight up the chimney without circulating round the stove, and thus overcoming the difficulty of a slight down-draught (Richmond's Patent).



In this Stove we have combined—

1. Chaste and Elegant design. The Ornaments are relieved artistically with Gold, and Figures Bronzed.

2. Most Perfect Patent Waste-Heat Arrangement yet invented. See section.

3. A combined Water Pan and Fender, from which vapour is delivered along with the pure heated Air into the apartment.

The advantages of the two last-mentioned features cannot be over-estimated. We are sure this Fire only needs to be seen to be purchased.

Filled with Double Corrugated Iron Fret or Ball Fuel at same price.

The "SUPERB." No. 480 Series.

The "VICTOR." No. 470 Series.

	With Stand. High. In.	Wide. In.	Deep. In.	Stove Enamel Gold Relieved. Figures Bronzed.	Best Victoria Bronze.
470 Fret 1470 Ball	30	19½	7½	£2 5s.	£3.
472 Fret 1472 Ball	31½	21½	9	£2 15s	£6.

	With Stand. High. In.	Wide. In.	Deep. In.	Stove Enamel Gold Relieved. Figures Bronzed.	Best Victoria Bronze.
480 Fret 1480 Ball	30	22	9	£2 15s.	£5 10s.
482 Fret 1482 Ball	31	24	10	£3 5s.	£6 10s.

Stand and Water Pan, extra 8s. 6d.
Richmond's Patent Damper, extra 4s. 6d.

Sizes, 470, 1470, 480, 1480 — 22 in. × 12 in. × 2 in. high.

472, 1472, 482, 1482 — 24 in. × 13 in. × 2 in. high.

Temporary London Offices and Show-Rooms, 65 and 66, Basinghall Street, E.C. Mr. J. F. Simmance (for 12 years with W. Sugg & Co., Ltd.), Branch Manager.

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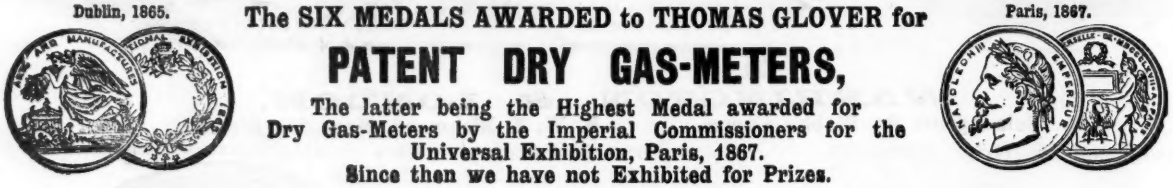
London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

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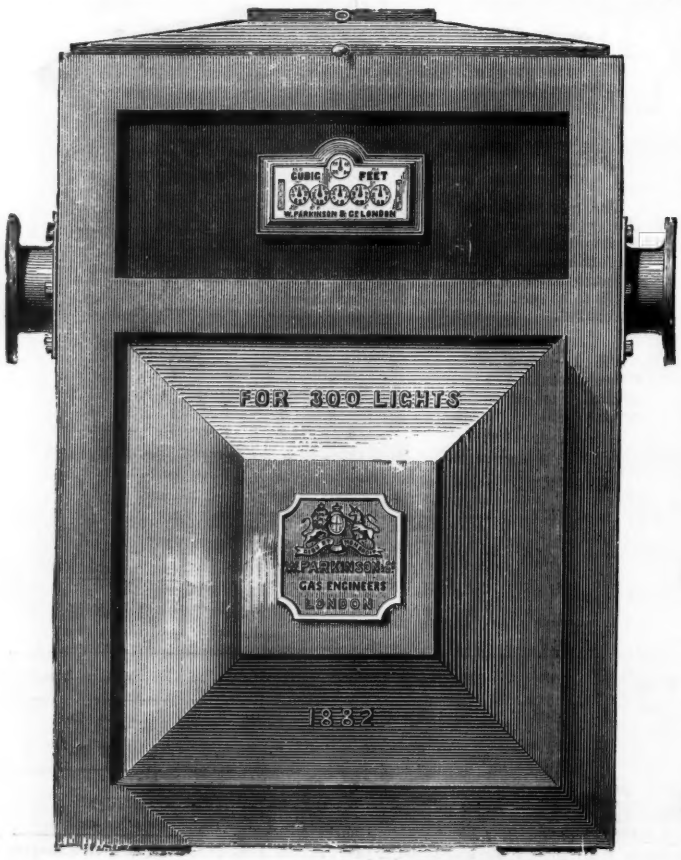
1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The DIAPHRAGMS are of the Finest PERSIAN SHEEP SKINS.

The CASES are of the Best CHARCOAL-TINNED PLATES.

WET METERS,

With PATENT THREE-PARTITION DRUMS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 8, 1891.

A Week of Gas Explosions.

MISFORTUNES, it was long ago observed, do not come singly; but it is an unusually striking exemplification of the truth of the observation that we have now to record. Three serious gas explosions occurred last week—in Blackburn, Glasgow, and London respectively—which variously illustrate the ever-present danger lurking in some of the conveniences of modern civilization, taken in conjunction with the persistence of human recklessness and stupidity. The Blackburn incident surpasses all catastrophes of the kind that have ever been chronicled in the history of gas supply, whether it is judged by the standards of damage done, of loss of life and suffering caused to innocent people, or of crass folly and carelessness on the part of its perpetrators. A report of the circumstances will be found in another column; but the story is essentially a short and simple one. It appears that there stood fronting the Market Square of Blackburn a house of call, or hotel, mainly used by market people, who were at one time accustomed to obtain gas for their stalls from a meter situated in the basement of the hotel. Arrangements having been made for the independent supply of the stall-holders through meters of their own—which one would regard as a decided improvement, for several reasons, upon the earlier custom—the large meter previously used was no longer required; and it was sold to a man named Robinson. This man, who is described as a "fruiterer," but was probably a sort of general dealer, went with his brother—neither being a qualified gas-fitter—to remove the meter, and for this purpose he cut or unscrewed the metal inlet-pipe, reported to be 3 inches in diameter, while it was fully charged. The result was, of course, a great outrush of gas, with which the man was powerless to deal; and he then appears to have lost his head. He rushed out of the vault, and went to give the alarm at the Gas Offices; but meanwhile an explosive mixture of gas and air rapidly filled the building, and ignited at the nearest fire or gas-burner. The effect of the explosion was terrible. The detonation was heard more than three miles away; and the hotel and an adjoining shop were demolished—five of the inmates at the time being killed, and at least ten more injured. The wretched bungler who brought about all this mischief has delivered himself up to the authorities; and his companion has followed his example. We have no desire to reflect upon this man's action, for which he will in due course have to answer at the bar; but it is shocking to think that the community is at the mercy of such ignorant meddlers as he has confessed himself.

In the Glasgow affair, which was happily unattended with loss of life or serious injury to the person, the gas accumulated in a sewer in course of construction in connection with the new underground Central Railway, and fired, at the top of the shaft, at a workman's lamp. The whole of the subterranean workings seem to have been blown up; and if the ignition had taken place at any other time than it did—which was early in the morning—in all probability the results would have been disastrous. With regard to the cause of the presence of gas in such quantity in the sewer, it is stated that, owing to the disturbance of the subsoil by the railway operations that were in progress, a 9-inch water-main broke, and the escaping water washed the ground from under an 18-inch gas-main, which accordingly sank, and leaked at the joints during the night. A smell of gas was perceived by a few of the workmen and watchers on the job; but there was nothing in this to attract particular attention, in view of the fact that the gas-pipes in the street had been uncovered, with the usual result of displacing some odoriferous soil. On the whole, the best that can be said about this Glasgow accident is that it might have been very much worse, and would still have been a true accident. Of course, a safety-lamp might have been employed. But it is impossible to impute carelessness in this respect; and the sound of rushing water in the workings, which appears to have been the first thing to attract attention, could hardly be expected to arouse any misgivings as to the condition of the gas-mains.

The London explosion, which was in the very part of Knightsbridge where the Van Steenbergh water-gas plant was exhibited, was of the usual order—the result of looking for an escape of gas with a naked light. A "flat" in a large building in course of construction was wrecked, and four men were more or less seriously injured. Against this class of "accidents" there can be no safeguard while fools of the order described by American humorists as the "didn't-know-it-was-loaded brand," walk about in the guise of reasonable beings. There will always be a few individuals of this type in every community; for the elimination of fools is a slow as well as a painful and troublesome process. Unfortunately, the damage done by this class of persons does not confine itself to its originators, or one might regard it more philosophically. It is a low average, but the fact is not less striking, that of the three gas explosions which fall to be chronicled in this

issue of the JOURNAL, two are directly traceable to gross folly and carelessness in the persons implicated, while the third might have been prevented by the exercise of particular, though not excessive or unprecedented, caution.

A Valuable Blue Book.

A BLUE BOOK of an interesting and important character has just been issued, containing a report to the Board of Trade on the "Relation of Wages in Certain Industries to "the Cost of Production." The report is signed by Mr. T. H. Elliott; and it has been prepared in compliance with instructions issued, through the Secretary, by the President, on the 1st of January, from "information con- "tained in parliamentary publications, and the accounts "of leading joint-stock companies, with reference to the "proportions borne by the cost of raw material, wages, "other expenses, and profit, to the realized value of the "products in the leading industries of the country, and "especially the proportion paid in wages, and also with "reference to the capital engaged in the industries dealt "with, and the proportion thereto of the profits available "for distribution." It is admitted that the results of any such inquiry must necessarily be fragmentary and incomplete, since the data obtainable from publications mainly issued for independent purposes could not be supplemented by specific and individual inquiries. Still, Mr. Elliott has succeeded in getting together a considerable bulk of authoritative information, of which it may be expected that extensive use will be made in future discussions of wages and working hours in the various industries implicated in his inquiry. Gas manufacture quite naturally finds a place in this book; the statutory publication of the accounts of the three Metropolitan gas undertakings being a convenient point of departure for such an investigation as that of Mr. Elliott. The last year with which he was able to deal as a whole was 1889, during the second half of which the effects of the Eight-Hour movement and of the South Metropolitan strike manifested themselves in a sudden increase in the cost of labour. These accounts are specially dissected; and they are supplemented by analyses of those of the Corporation gas undertakings of Birmingham, Leicester, Lincoln, Manchester, Stafford, and Warrington. It is remarked, with reference to the Metropolitan Gas Companies, that their expenditure is high in proportion to their total trading receipts; the cost of production in their case averaging 71·1 per cent. for the year 1889. Rather more than one-half of the expenditure—36·3 per cent. of the working receipts—was for purchasing coal, the material employed in the process of manufacture, which in itself requires a large outlay in wages. Mr. Elliott comments upon the amount of the coal bill of the three Metropolitan Gas Companies as furnishing proof of the importance of these concerns from the industrial point of view, apart from any consideration of their own wages payments. Yet these are the "monopolists" whose downfall, in consequence of the spread of electric lighting, is prophesied with such curious glee by professed representatives of the labour interest. Referring to the analogous examples of the gas undertakings carried on by municipal corporations, Mr. Elliott remarks that "in "nearly every case the cost of coal is about one-half of "the total expenditure and one-third of the total receipts; "and if allowance be made for charges into which the pay- "ment of wages does not directly enter, it would appear "that the wages bill approximates to one-third of the ex- "penditure, and to something more than one-quarter of "the receipts." By the help of the parliamentary returns relating to gas undertakings, these ratios are applied to the British gas industry as a whole, with the very striking result that the proportion of expenditure to receipts comes out exactly identical to that arrived at in the Metropolitan Companies alone—namely, 71·1 per cent.; "and it can- "not be very wide of the mark to say that the conversion "into gas of coal costing about £5,500,000, involves a "direct expenditure in wages of between £3,750,000 and "£4,000,000," and that the average profit return upon the capital sunk in the industry is 7¾ per cent. If Mr. Elliott's tables had been prepared with reference to the following year, they would have shown a still higher share for labour and a lower rate of profit in regard to the operations of the statutory gas undertakings of the United Kingdom. This return comes very opportunely just now. A copy of it should be procured forthwith by everybody who is interested in the general subject.

The Standard of Light.

IF one may judge from what passed at a recent meeting of the Common Council of the City of London, the Board of Trade have not dropped, as was at one time supposed, their idea of doing something towards obtaining a settlement of the vexed question of photometrical standards. Some months ago, it appeared as though the Board of Trade and the London County Council had spurred one another on to "tackle" this long-standing difficulty. The County Council threatened to apply for an Act of Parliament for the disestablishment of the standard candle; and the Board of Trade rejoined with a declaration to the effect that they were about to appoint a Committee to recommend something by way of a standard to take the place of the candle. Then arose a question respecting the payment of the expenses of such a Committee; and the matter seemed to come to a deadlock, because nobody concerned was willing to provide the necessary funds. The Board of Trade said they had no money available for such a purpose; the County Council declined to mulct the Metropolitan ratepayers for the expenses of what they regarded as an investigation of Imperial interest; and, of course, the London Gas Companies did not see their way to subsidize any such Committee. So the matter rested; and all mention of it was kept out of the parliamentary notices issued in due course by the County Council. Only last week, however, the Common Council received a notification from the Board of Trade to the effect that a Committee upon the photometrical standard of light is to be appointed, after all, and asking the Corporation to nominate a representative who might be included in such a body. After this rate, it may be gathered that the Board of Trade think of constituting their Committee upon the representative principle, and perhaps of distributing the expenses accordingly. However it is done, it is certainly high time that the photometry of gas was put upon a better footing than the practice now occupies. In connection with this topic, reference may be made to the correspondence now appearing in the JOURNAL on the subject of the compulsory stamping of photometers. We would respectfully warn those who have taken, or who may contemplate taking, part in this little controversy, that the point at issue is not to be disposed of by arguments and references *ad hominem*. The point is, not what ruling different people would prefer to see in this regard, but how the law does really stand.

Exhibitions without Gas.

THERE is to be an Electrical Exhibition at the Crystal Palace in the early part of next year; but gas lighting will not participate in the display, which is to be organized mainly with the object of assisting local authorities to select systems of central station lighting. Doubtless many plans, good and effective in their way, will be shown on this occasion; but we may be sure that if to one of them could be affixed the label "Guaranteed to return a "profit of 5 per cent. on the cost," nobody would look at the others. Electricity will also be very much in evidence at the forthcoming Chicago World's Fair, albeit in the rough-and-ready American style which is best suited for home consumption. Gas will not be conspicuous at this great show. It will not be patronized more than can possibly be helped by the exhibition authorities, who have declared their intention of only using gaslight as the very last resource. The associated gas interest of the United States has approached the authorities with reference to the display of gas for its own sake, and without preference for particular patterns of apparatus; but they have only succeeded in obtaining permission to erect a separate pavilion somewhere in the exhibition grounds, as was done by the French Gas Companies under the shadow of the Eiffel Tower in 1889. Thus, again, the Americans confessed their subservience to French leading. The United States gas interest, however, does not see its way to raising the £20,000, or thereabouts, which such a pavilion would cost if the work were properly carried out; and it is wisely decided that, since any organized display of the kind cannot be well done, it is better left alone. Gas apparatus, of course, will be on view in the exhibition; but it is hardly in the nature of this class of commodities to attract much popular admiration. We wonder whether real home-made gas-meters, with real American tin-plates in them, will be shown in connection with the great M'Kinley trophy which ought to occupy the central position in the exhibition! The Council of the Society of Arts,

it may be noticed, are doing their best to create interest in the United Kingdom in this Chicago enterprise; but a Protectionist nation proclaims its desire to be independent of foreign manufacturers, and cannot therefore expect the latter to assist it in getting up an industrial and commercial exhibition. The exhibition season may be a good time for Englishmen to visit the States; and those gas engineers of the United Kingdom who will have an opportunity for doing so, will be certain of a hearty welcome from their professional brethren on the other side. But we do not expect that the exhibition will do anything for the gas industry of either hemisphere.

A Glaring Imposition.

One of the most hackneyed quotations in the British tongue—we scarcely dare call it the English language—is Robert Burns's poetical aspiration after the power of seeing ourselves "as others see us." There cannot be many days in the year when some hardly-pressed journalist does not remind some particular collection of newspaper readers of this petition of the immortal gauger; and how many times in the course of the year journalists of Scottish extraction deem it desirable to freshen up their lucubrations with this sparkling bit of human nature, we should not like to say. There is, however, just another thought complementary to the feeling that found competent expression once for all in Burns's couplet, which has not received such perfect crystallization in memorable phrase. If the philosopher would really and truly like to see himself as he appears to others, so would not many good people of weaker mould. When we come to think of it, very few of us would really feel happy to dispense with our little self-conceits, which wrap us round so comfortably, and protect us so well against the slights of an unappreciative world. Take away a man's conceit in himself, and he is a poor creature, unable to do any good to himself or to others, albeit not powerless for harm. Far rather than "see oursels as others see us," would most of us enjoy the power of compelling others to take the same flattering views of us as we usually do of ourselves. How very much nicer that would be, all round! This reflection would naturally occur to a gas engineer upon seeing a certain sketch in last Saturday's *Daily Graphic*. It is a view of Queen Victoria Street, City, as the imagination of the Engineer of the City of London Electric Lighting Company would fain have it appear under the beams of the arc lamps which have for the time being taken the place of gas in that fine thoroughfare. When we caught a first glimpse of this small, though striking picture of a scene that was so familiar, even in its disguise, we thought it was intended to represent the effect of a sudden and heavy fall of snow upon the roadway and pavements, which are represented as glaringly white between the blackened house frontages. A second and closer inspection, however, revealed the rather amusing fact that the startling appearance of the street was ascribed to the effect of the new electric lighting. Why the lamps failed, in the artist's perception, in lighting up the house fronts to which they are necessarily much closer, in spots, than they ever are to the centre line of the roadway, must remain a mystery. It is to be supposed that in this regard, as well as in that of the degree of illumination of the roadway, he drew rather what he wanted to see than what actually lay before his eyes. In this case he is not to be more complimented upon his taste than upon his fidelity to truth; for few people would esteem as a "thing of beauty" a whitewashed road between inky façades. It is in respect of the degree of illumination received by the road surface, however, that the artist has imposed his own desires most glaringly upon the public. The "milky way" is the blackness of Erebus in comparison with the dazzling thoroughfare of his fond imagination. If the vision could be realized, every driver of a vehicle and pedestrian in those parts would be under the painful necessity of wearing goggles as a safeguard against snow-blindness. Fortunately, however, the reality is very different. We should not have deemed it necessary to treat the electricians of the City of London Company to a criticism of their street lighting performance, as seen by others, but for this audacious attempt to make it appear what it certainly is not. Briefly, then, while it cannot be denied that arc lamps of about 1000-candle power, maximum and naked, are capable of fairly lighting a street when spaced at intervals never exceeding 50 yards in any direction, it is also true that, even so, for the production of a good effect several circumstances must be combined. When the lamps are at their best, they only show well when the atmosphere is clear, and when the roadway and footpaths are clean, dry, and therefore comparatively white in tone when viewed from a distance. When the air is thick—and this is generally the case in winter—and when the road and pavement surfaces bear a non-reflecting coating of dingy mud (which they do for weeks on end), it is a compliment to the arc lamps to call them anything but ineffective. Their light loses itself to an astonishing degree in a heavy atmosphere; and its power of making other things visible seems to suffer even greater depreciation than its own brilliancy. This is the truth about the City lighting, as can be seen by anyone who has to pass the scene of the experiment after dark during all weathers.

WATER AND SANITARY AFFAIRS.

Only a few of the Bills to be introduced in the coming session of Parliament, relative to the water supply of towns, possess any features of magnitude. An abstract in brief, of these and other projects, will be found in another part of our columns. Even the London Water Bill, brought forward by the Corporation in conjunction with the County Council, contributes nothing in the shape of a comprehensive scheme, and is simply a preparatory measure, except that it proposes the immediate appointment of a Water Committee, which will enjoy the distinction of a name without any corresponding possession. Birmingham has come forward at a critical moment with a project for taking a water supply from Mid-Wales; thereby forestalling the London County Council. The capital of the Midlands seeks to emulate Liverpool and Manchester, and has sought advice from the authorities of those cities as to the best mode of framing a Bill, so that it shall get through Parliament. The financial aspect of the Bill is one which, as we have intimated on a former occasion, may very well serve as a warning to the ratepayers of the Metropolis. Borrowing powers are sought to the extent of £6,600,000. Sir Thomas Martineau, who laid the Bill before the Birmingham City Council, acknowledged that the amount named was "a pretty bold sum," but pleaded that provision was to be made for a future of half a century. All the money is not to be spent at once; the first outlay being £3,340,700. Mr. Mansergh estimates the whole of the instalments at £5,654,958. But this is for bringing the water into the reservoirs. Distribution and other forms of what is termed local expenditure require a further sum of £761,250; making a total of £6,416,208. Accordingly, there seems a tolerably fair chance for the exercise of all the borrowing powers. Two elements in the scheme help to account for the expense. A considerable quantity of land has to be purchased, so that the Corporation may become possessors of the watershed, with a view to obviate all risk of future pollution. In the second place, provision has been made—it is said on a liberal scale—for supplying compensation water to the lower reaches of the rivers. It has been pointed out that the estimates have been augmented by a million sterling since this project was brought before the City Council a short time ago. Such is generally the nature of estimates; and while we are not prepared to deny that the Birmingham scheme is a good one, we would draw attention to the extreme cost which accompanies projects of this description.

The Bradford Corporation have seen reason to alter the scheme of extension for which they obtained authority in their Water Act of last year. The plan now proposed requires power to raise £100,000. There is to be a storeage reservoir at Haden Carr, on the River Nidd, with an embankment 555 yards in length. Another storeage reservoir, at Woodale, on the same river, is to have an embankment of somewhat less extent. Two service reservoirs are to be constructed at Chellow Heights; and, in addition, there is to be an alteration and enlargement of existing works. Among the other notices of Bills, there is one on behalf of the Glasgow Water Commissioners, seeking for power to make certain deviations from the line of aqueduct sanctioned in 1885. An extension of time is asked with respect to the completion of a reservoir; and there is a proposal for supplying water under pressure for

hydraulic power. Some more money also is wanted. The Kilmarnock Corporation desire to purchase, by agreement, the undertaking of the Kilmarnock Water Company. The Ipswich Corporation propose to purchase, compulsorily or by agreement, the undertaking of the Ipswich Water Company. The Rhyl District Water Company appear to be much sought after. The Rhyl Improvement Commissioners wish to purchase the Company's undertaking, by compulsion or agreement; while at the same time a Bill is coming forward giving power to the Abergele and Pensarn Local Board to form a Joint Board with Rhyl and St. Asaph for the same purpose. A further appearance of this Company consists in the notice of a Bill providing for a new reservoir and aqueduct, accompanied by the appropriation of a local stream. The Swansea Corporation seek power to obtain a new supply of water, to be taken from the River Cray, in Brecknockshire. The scheme seems somewhat large, as selling water in bulk is to be authorized, and provision is to be made for compensation water, together with power to raise more money. The Exmouth and District Water Company propose additional works, and seek power to take and impound waters. The District Committee of the Middle Ward of the County of Lanark seek authority to construct works and supply water; the plan including two storeage and five service reservoirs. An extension of existing water-works is proposed by the Tredegar Local Board, the Sunderland and South Shields Water Company, the Corporation of Barrow-in-Furness, the Brynmawr and Abertillery Gas and Water Company, and other bodies. The Corporation of Leeds include in their Consolidation and Improvement Bill power to sell water in bulk, and to abstract water from the Rivers Wharfe and Washburn. The growth of towns leads every year to a further appropriation of rivers and streams; and the water projects for the ensuing session, if sanctioned, as we may suppose most of them will be, must necessarily involve a considerable expenditure of capital. A better provision of water will be made for sundry towns, leaving less for other places. Parliament will have to see that in this matter there is no undue encroachment.

The Price of Gas in Brussels.—We learn from our Brussels correspondent that the proposition of M. Reichald to reduce the price of gas in the city to a uniform rate of 12c. per cubic metre, to which reference has already been made in the JOURNAL, has been supplemented by another from the same gentleman, suggesting a public lighting tax to make up any deficiency in the municipal revenues caused by the new tariff. The basis upon which this tax is to be assessed will be the frontages of the houses; and it will be calculated at per metre, in accordance with a classification of streets which has been adopted for other taxes. Both propositions are likely to meet with approval.

The Capacity of Storeage Reservoirs.—According to a paper on the method used to determine the best capacity to be given to one of the reservoirs of the Boston (U.S.A.) Water-Works, read before the Boston Society of Civil Engineers by Mr. D. FitzGerald, and published in the *Journal of the Association of Engineering Societies*, it appears that the area of the watershed was assumed as 5·9 square miles, while the topography indicated that there were three important grade-lines which it was desirable to investigate. These were 290, 295 and 300 feet above datum. They flowed respectively over 185, 235, and 570 acres; and the relative capacities of the storeage reservoirs built at these three levels were found to be 1259·7, 1603, and 2224 million gallons. On the basis of 11 inches collected, and with the usual deductions for water surfaces, the Indian Brook, on which the reservoir was to be built, would yield 2,906,754 gallons daily. To equalize this flow of nearly 3 million gallons, requires about 348 million gallons of storeage, or 120 days' supply. It is evident that all storeage above this quantity can, after being divided by 365, be added to the daily yield of the stream. In the case of the 290-feet flow-line, this gives 2,495,600 gallons daily to add to 2,906,745; making 5,402,345 gallons. The same treatment pursued with the other two flow-lines gives 6,342,862 and 7,860,369 gallons per day respectively. An accurate record has been kept for a number of years, on the Sudbury River watershed, of the actual monthly collections per square mile. Some of these records were selected, embracing two years of maximum drought—1881 and 1883. This period extended from 1878 to 1884, inclusive. The basins were assumed to be full in 1878; and after crediting the stream for what it would have yielded monthly, it was found that the greatest amount that could be drawn from the 290-feet reservoir was only 4,484,000 gallons daily; from the 295-feet, only 4,691,559 gallons; and from the 300-feet, only 4,718,600 gallons. The cost of the reservoirs, exclusive of land damages, was estimated at $650,302 for the 290-feet, $742,521 for the 295-feet, and $1,082,697 for the 300-feet; and the cost per million gallons, with 11 inches collection and one dry year, was found to be $13·19, $12·83, and $15·09 respectively.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1057.)

THERE is hardly any change to be noted in the position of the Stock Markets in general. They are all inactive; and on all sides there appears to be a disposition to wait a little longer, and get a better view of the general outlook, before going in. Speculation being at a standstill, business has been mostly in investment stocks—prompted, to a considerable extent, by the falling of the value of money. The market for the latter commodity is even easier than it was; and if this condition is maintained, the rate of discount must fall. The Gas Market has been somewhat more active than it was the previous week; and the tendency towards advanced values which then manifested itself, has been strongly accentuated. In contrast, however, to the general disposition in favour of the choicer securities for investment purposes, the secured issues are lower. Gaslight "A" rose freely; and, from 222½ on Tuesday, it mounted to 228 on Saturday. The "H" 7 per cent. limited also advanced 1½. There was not much done in the preferences, and nothing at all in the debentures; but the 10 per cent. issues of the former were depressed. South Metropolitans were in good demand, and marked higher figures; the quotation of the "A" stock rising 5. Only one transaction was recorded in Commercials—some old stock changing hands at a rather low price. Suburban and Provincial undertakings are unchanged, with next to nothing doing in them. The Bristol Company have disposed of their £20,000 of 4 per cent. debentures at an average price of 104; thus getting their money at £3 17s. per cent. interest. All the Foreign companies have been quiet. Imperial Continental was the most active, and the strongest; advancing 1, with a promise of doing better. Among the South Americans, Monte Video and San Paulo were weaker—each receding ½; but Buenos Ayres debentures were in better odour, and showed a disposition to improve. The Chicago second mortgage bonds were quoted 1 higher "*ex* interest." Other issues presented no feature of note. Water quotations have been heavily hit; and the figures have been put down very freely. It is not probable, however, that many holders have been frightened into selling, and transactions were very restricted. While the open stocks were being depressed, Lambeth debenture stock rose 2.

The daily operations were: Gas opened well on Monday, hough business remained rather limited. Gaslight "A" and South Metropolitan "B" marked top prices; but quotations stood still. New River fell 5. Tuesday's Gas business was even more restricted; but prices were on the rise. Gaslight "H" advanced 1½; and Imperial Continental. 1. San Paulo, however, fell ½. Water still fell. Southwark "D" receded 7½; and Grand Junction and Lambeth, 1 each. Debentures of the latter Company rose 2. Gas was a shade more active on Wednesday; and Gaslight "A" rose 2. On Thursday, the tendency was good throughout; and Gaslight "A" improved 1 more. Business was quieter on Friday; but Gaslight "A" continued its advance, with a further rise of 2; and South Metropolitan "A" improved 5. Gaslight 10 per cents. were lower; and Monte Video fell ½. In Water, Southwark fell 5; and Chelsea, 2½. Saturday was unusually active; and Gaslight "A" made another advance of 1. Water continued to fall; East London receding 2.

ELECTRIC LIGHTING MEMORANDA.

The Applications for Electric Lighting Orders—Alderman Gibb on the St. Pancras Venture—The City of London Contracts—The Cardiff Scheme.

THERE is a fair, although not a large, crop of notices of intended applications for Electric Lighting Orders next session; and electric lighting powers are also mentioned in one or two Bills promoted by Local Authorities. Perhaps the most important of these projects are those relating to parts of the Metropolitan area not already covered by authorized ventures of the kind. A good many towns of considerable size figure in the list of applicants; but the largest places have a way of coming for very limited powers; and consequently it does not follow that the most important Local Authorities contemplate spending most money upon electric lighting. Electrical specialists find a respectable amount of work in settling the terms of these applications; but it is usually a "far cry" from the petition for the Provisional Order to the issue of contracts for the actual work. It is but natural for the Local Authorities who are driven to acquire electric lighting powers in order to keep speculators out of their streets, but who have no great liking for the venture, to put off to the farthest possible date the day of final commitment to the spending of money, in the hope that something may turn up to improve the prospects of electric lighting as a business.

Mr. Alderman Gibb, the Vestry Clerk of St. Pancras, has been making use of the journalistic "interview" as a means of advertising the parochial electric lighting scheme for which the London County Council have just sanctioned a 42 years' loan.

The argument that prevailed with the Council to yield to this extent—making the period for repayment of the loan coincide with the duration of the Order, instead of with the estimated life of the plant—is not very conclusive. Mr. Gibb seems to think that since the plant must always be maintained in good repair, its cost may as well be redeemed at the end of 42 years as at an earlier period; but it is difficult to understand why the same plea could not be employed, with equal force, to favour the postponement of repayment to 100 years. Mr. Gibb's views on the subject of the benefit to the district of the step taken by the Vestry in the matter of supplying electricity, "verge on the enthusiastic," according to the opinion of the newspaper reporters to whom he has unburdened his mind. He pretends to believe that, while the Vestry are going to make a profit by selling electricity at 6d. per unit, the inhabitants will be eager to take as much as they can get at this price—not only for lighting but also for motive power. "We shall drive their sewing and washing machines for them," says the sanguine Vestry Clerk. All we feel disposed to remark upon this expectation of Mr. Gibb is that we hope he will never be required to explain away a disappointment to the Vestry. He has had some "bad quarters of an hour" in his time, in his dealings with vestrymen and ratepayers, whose language, when their feelings are touched, is apt to be "frequent, and painful, and free." But, in our candid opinion, the electrical venture will turn out a more unpleasant "secret" for the St. Pancras people than anything of which they have yet had experience. These are "primrose days" with the Electric Lighting Committee of the Vestry. The fun will begin with the ratepayers when the electric light works have been in existence long enough to repeat the experience of those other ventures of the same order, in London and elsewhere, which are at the present time desperately trying to make ends meet with a selling price 33 per cent. higher than that contemplated for St. Pancras.

It was mentioned in this column last week that the contractors for the electric lighting of the City of London had applied to the Commission of Sewers for an extension of time, of at least one year, in the period allowed under the contract for establishing the light in the scheduled streets. The actual contractors were able to support their petition by showing that they only entered upon their obligations in August last, when they found that only six months remained unexpired of the time prescribed for the street installations, and "nearly everything remained to be considered and done" in the matter. The plea was a reasonable one, so far as it represented the circumstances of the contractors; but the present Company are the result of a complicated process of financing and Company promoting which was set going under the shadow of the Mansion House when the lighting contracts were given out. The Commissioners of Sewers have marked their sense of these performances by refusing to accede to the request for an extension of time for the execution of the contracts; and they strengthened their censure by allowing it to be seen that they will be better pleased if the opportunity offers for annulling altogether the agreements in question. It is asserted to be simply impossible for the City of London Electric Lighting Company to complete the contracts for which they paid so dearly by the time originally fixed. In the event of their making default, they will forfeit the £3000 deposited as caution-money, and will be in no better position than any other speculators when fresh tenders are asked for by the Commission. This is the result of the operations of the now-defunct "Pioneer" Company out of which the ex-Lord Mayor and his associates made so much. The Commission are evidently very sore on the point; and they are not disposed to mince matters with those who have hawked about their street lighting contracts in such a notorious fashion.

The report relating to the Cardiff Corporation electric lighting scheme, which we published last week (p. 1002), may be perused with interest as an example of corporation methods of going to work in regard to a project for electric lighting. The Corporation have a Provisional Order; and a Sub-Committee was appointed to confer with a professional electrician as to what should be done with it. In consultation with this gentleman, it was agreed that Cardiff could not possibly be safeguarded in the matter at issue unless the members of the Sub-Committee—together with the Borough Engineer and the Town Clerk—visited the Frankfort Electrical Exhibition under the direction of their electrical "guide, philosopher, and friend." They took Brussels and Paris on their way; and it would be an insult to the members of this personally-conducted party to doubt that they had what Americans would term a "good time" generally. After all, they came back to Cardiff with a scheme which, to say the least, might have been concocted much nearer home. There is very little of Frankfort about the idea of lighting streets with electric arc lamps for half the night and using gas for the rest. Such a simple device might surely have been "made in England," if not in Wales. The notion that a Corporation Committee are required to go from Cardiff to Frankfort, and there attend an exhibition—at the expense of the ratepayers—before they can entertain a respectable opinion about an electric lighting scheme, is simply ludicrous. Granting that such exhibitions are instructive to those who are qualified to understand the exhibits, where are the town councillors to be found who possess sufficient elementary knowledge of modern electrical engineering to be able to profit by the lessons in "multi-phase currents," and other recondite matters, for which the Frankfort display was alone distinguished? Surely, the weakness of members of country local authorities for "deputationizing," at the public cost, was never more strikingly illustrated than by this Cardiff example.

THE VICTORIAN BUILDING MATERIAL.

Since the perfectly accomplished gas engineer must be imbued with more than a faint tinge of feeling for architectural truth and beauty, if the buildings and structures designed by him are not to be gratuitously hideous monstrosities, no excuse is needed for occasional references to architectural topics in these pages. It is by no means difficult for a busy engineering constructor to acquire at least sufficient acquaintanceship with the principles of architectural design to avoid giving offence ignorantly by the disposition of details in his creations. Architectural truth is, after all, of the same kind as truth in engineering—it is a systematized common sense. Imperfectly-trained constructors are just as likely to commit blunders in their engineering as to give offence by their architecture. Sound engineering construction consists wholly in the employment of the best means to a definite end, with a rational apportionment of the strength of parts and the nature of the materials to the purposes of the structure. Simple and obvious as is the definition, however, it is by no means easy to illustrate in practice. The major part of so-called engineering design is mere copying from previous examples, with the necessary pinching in or letting out to fit the new requirement. Nor is it any discredit to an engineer that the greater part of his studies consists in the adaptation and extension of old models to fresh needs. He is no fool who knows what to copy, and what to drop, in progressive constructions; and a vast deal of progress is only the aggregation of small improvements made from time to time as occasion suggested. It is no indication of true engineering skill to be always straining after novelty in planning or in executing engineering work. Original geniuses are as rare in the engineering profession as in every other. They exist, of course, or else all engineering work would go round and round in a circle; but even genius would make a small mark upon the science of its day, if there were not a host of keen appreciators to one originator, whereby the suggestion of a single mind is applied by the talent of many to an infinity of purposes transcending individual perception, however enlightened.

Now and again a fresh idea has to be expressed by engineering construction; and then it is made apparent whether the designer is or is not perfectly instructed in his business. If he is a master of his art, he will use the proper materials, and arrange them properly for the attainment of his object; erring neither on the side of wasting stuff in superfluous scantlings, nor on that of skimping material. If, in addition to being an able engineer, he has also a fair share of architectural feeling, he will avoid breaches of architectural principles; and in no way does an engineer more plainly exhibit his possession of this feeling, and his adherence to these principles, than by abstaining from borrowing architectural forms, styles, and ornaments for unsuitable applications. A poor engineer, whose designs offend the instructed engineering critic by the misuse of material and the disproportion of parts which they betray, is usually the very man to go astray in matters of taste. If he makes a column do the work of a buttress, and has it cast far heavier than is necessary, the chances are that he will paint it to imitate marble. He will seek to cover the hideousness of a badly-designed structure by loading it with "ornament;" and will probably also disguise the ornament by some method of surface treatment intended to misrepresent its nature.

The true engineer is superior to this littleness. When he is required to span an arm of the sea with a mighty bridge, or to construct a great gasholder, he shows his regard for architectural principles by dispensing with architectural forms, and by permitting his work to attest itself in its own style, and in consonance with the nature of the material of which it is made. It is due in no small degree to this single-mindedness of engineers, which impels them only to see the object set before them and the readiest means of attaining it, that engineering presents in these modern days the aspect of a living art. Engineers have always worked with the materials that lay readiest to their hands. Engineering construction consequently bears witness to successive Ages of Cast Iron and Stone, Wrought Iron and Brick, Steel and Concrete. These periods are further identified with the names of a series of masters, such as Stephenson, Brunel, and Baker. Architecture, on the other hand, is a beautiful tradition. Why is it that we have no truly modern style of architectural design, and that, when we leave the drawing office of the engineer for that of the architect, we seem to quit the art of the living for that of the dead? Mainly, as we hold, because our architects do not feel the same necessity as engineers for working with the materials of their own time. All that can be said architecturally in stone and in brick has apparently been uttered by the designers of the past. Why cannot our existing race of architects tell us something in the language of steel and concrete? For if this is the Age of Steel, it is equally the Age of Portland Cement. If the former is a material for engineers to handle—

and how they can handle it let the Forth Bridge bear witness—is it too much to expect architects to do something for the splendid building material which this age has placed at their service? If the modern race of architects fail in this matter, they will deserve to be ranked low indeed in comparison with the artists in great and small stones, in half-timber and in brick, whose ideas they are so prone to reproduce. There should be a grand opening in monolithic construction for the genius who shall know how to work in the spirit of strength and simplicity which is suggested by cement concrete. Here we have a material such as the old builders never dreamt of—a binding composition cheap, strong, portable, and easy to use, which will convert many times its own bulk of any sort of hard rubbish into damp-resisting, fireproof walls and roofs. Where are the indications that modern architects are alive to the wide possibilities of this triumph of nineteenth century manufacturing industry?

Engineers have not neglected Portland cement, nor the concrete which it helps to make. As in the parallel case of structural steel, patient skill and daring enterprise have conquered one by one the difficulties which at one time environed the concrete user. Failures, however costly, have been improved into lessons for future guidance; until to-day the employment of cement concrete, whether in masses or in thin layers, for works underground or for lofty erections, is guided by a body of experience as large and as reliable as the technology of any traditional art. Indeed, the art of the concreter is the sole distinct advance that modern building construction can show when compared with the art that built Hampton Court Palace, to say nothing of the art that built St. Paul's, and traces unbroken descent from the art of the builders of the Pyramids.

What can be done with concrete in all its forms is not to be even hinted at here. Quite recently, however, we have been made acquainted with a system of concrete construction (or rather, it should be said, with a combined system of iron and concrete construction) which appears to constitute not merely a lesson to engineers, but also a challenge to architects. This is the so-called Monier Patent System, which, having been proved a success upon the Continent, is now being introduced into this country by the proprietors, who have taken premises in Upper Thames Street for the purpose of exhibiting its character and advantages for a multiplicity of purposes. Essentially, this is a system of combining into a structural element a network of iron rods covered and filled in with a fine cement concrete. With this it is asserted that houses can be completely erected—walls, floors, and roofs—bridges built, gasholder tanks constructed, sewers, reservoirs, &c., made, of any desired degree of strength, and be lighter, more durable, and less costly than similar constructions of any other equally effective material. Of course, combinations of iron with cement concrete are not new. On the contrary, concrete roofs, floors, &c., are invariably constructed of this combination; and it is not our purpose to exalt any particular pattern of cement and iron construction as naturally superior to others. It is claimed for the Monier system of construction, however, that while it partakes, with others of the kind, of the merits of speedy execution and independence of skilled labour, it ensures such a specially effective union of the strength and other good qualities of the iron and the cement, that the same working capacity may be secured with remarkable economy of material.

The idea seems to be to proportion the strength of the concrete to that of the iron; and when this is done, the thickness of the floors, arches, walls, &c., may be safely reduced in a surprising degree. Moreover, in the event of failure through overloading, either in the cold or as the result of a fire, floors and walls thus made exhibit a power of tenacity in ruin, so to speak, unlike anything that could be attributed to either cement concrete or to iron separately. This is, of course, a very important consideration from the point of view of public security. A Monier-built house cannot crumble to the ground in instantaneous collapse. Its walls might warp and yield, and its floors sag with their loads; but not even such a catastrophe as that of the gas explosion in the Blackburn market square could bring to sudden ruin a building of iron-wire netting and concrete. There would be time for the escape of the inmates, and probably also for the salvage of much of the contents. In support of this view, it is reported that the Chief of the Berlin Fire Brigade has issued an official order that firemen are to enter without hesitation all buildings constructed on the Monier system, as there is no risk of ceilings, walls, or stairs of this material falling in.

Some idea of the strength of this method of construction may be gained from the statement that whereas, in the usual so-called fireproof construction of floors with rolled joists and concrete arches, the latter are always from 6 to 10 inches thick at the crown, the Monier system for the same purpose would only be 1½ inches thick. Arches of this construction can be made to span 30 feet with a thickness of from 3 to 6 inches, and carry a safe load of 11 cwt. per square foot. The method of building a Monier arch—say, for a viaduct—is as follows: Centring being provided to the exact contour of the soffit, a number of battens are laid transversely to the span, to a depth of just one-half the intended thickness of the arch. These battens are to guide the workmen as to the thickness of the concrete layer, as well as to support the wire netting. The concrete being laid to the level of the top of the battens, the network of wire is placed over it. This is made of round iron or steel rods of calculated thickness—say, quarter-inch wire—and is not woven into a mesh, but the wires at their crossing are tied together with binding wire. Thus a square network is made—say, 3 or 4 inch mesh—and it is insisted upon that, since there is no crossing of the wires, these should lie perfectly straight in their concrete bed, and accordingly offer the maximum resistance to all deforming influences, whether in extension or compression. The network being in position, the remainder of the concrete is poured upon it, and thoroughly worked in among the interstices of the wires. When the arch is set sufficiently to allow of the striking of the centring, the battens are withdrawn, and the spaces filled in with cement. Many remarkable proofs are given of the capabilities of this method of construction. Among these, one of the most striking is that of a bridge over a canal at Bremen, which spans 125 feet, with a very small rise (about 7 feet), and is only 7½ inches thick at the crown. Another similar arch, of 30 feet span and 4 inches thick, carried safely a distributed load of 42 tons. The Hungarian Government tested a Monier arch of 8 feet span and 2 inches thick, rising 6 inches, with a distributed load of 31 tons, which was borne without deformation. Where these arches have been loaded to the breaking point, moreover, they have always subsided gradually, still bearing the load; and not in any case have they suddenly collapsed, even when the load has been concentrated on half the span.

Taken in conjunction with what has been recently noticed, in the JOURNAL and elsewhere, respecting the use of gas-works breeze and ashes as the raw material for concrete in house construction, the reports upon the capabilities of the Monier system open up a wide field of possibilities in regard to town building. We look to see massive blocks taking the place of low brick houses, and a gradual obliteration of the most obvious differences between the aspect of a stone-built town and a town of brick. Only, in order that this process shall be satisfactory to the eye, the co-operation of architects is needed. Concrete, whether after the Monier system or another, is the new building material of the time. Of course, some architects, of the *hortus siccus* variety, will not learn how to use it. Seeing that these very æsthetic gentry cannot deal with a sheet of plate glass of larger size than was available in the days of Queen Anne, and have never known what to do with gas as a means of lighting, it would be too much to expect them to bend their minds to the possibilities of a concrete frame. There are others, however, who see which way the building art is turning; and to them it is possible to look for help. Would it be too much to ask the governing body of the Royal Institute of British Architects, when next they meet for the purpose of drawing up their scheme of examination in Architectural Design, to turn their attention from Renaissance pavilions and Temples of Vesta, so far as to offer a prize for the best design for a middle-class town residence, embodying all the latest resources of the builder's trade? Architects have a great opportunity in concrete, if they will but recognize it.

The Gaslight and Coke Company and their Residuals Sales.—We understand that the Chartered Gas Company have decided to sell against their buyers all arrears of deliveries of sulphate. To-morrow (Wednesday) the notices expire that have been given to all firms holding stocks at the Company's works, that unless their contracts are taken up the sulphate will be sold against them in the open market.

Appointments.—Mr. Arthur Forrett, son of Mr. T. Forrett, Manager of the Alfreton Gas-Works, has been appointed Manager of the South Normanton, Blackwell, and Hucknall-under-Huthwaite Gas Company, Limited. The Town Council of Tain (N.B.) have selected, out of 36 applicants, Mr. Andrew Ross, of the Paisley Corporation Gas-Works, to be Manager of the gas undertaking they have just acquired. Mr. George H. Clark, who has been engaged on the works of the Aylesbury Gas Company for the past five years, has entered into an engagement with the Pará Gas Company, and will leave Liverpool on the 20th inst. to commence his duties. Mr. Clark has just been awarded the full Technological Certificate of the City and Guilds of London Institute in the Honours Grade in "Gas Manufacture."

A Water Inquiry by the Royal Society and the County Council.—At the anniversary meeting of the Royal Society on Monday last week, the President (Sir W. Thomson), in the course of his address, stated that a matter of great importance in respect to the health of the community was submitted to them by the London County Council on the 1st of May last, asking for information, and suggesting investigation, regarding the vitality of microscopic pathogenic organisms in large bodies of water, such as rivers which are sources of water supply and which are exposed to contamination. After some correspondence, it was agreed between the County Council and the Council of the Society to enter upon an investigation, the expense of which was to be defrayed partly by each body—by the latter out of the Government grant for scientific research. When it was considered how much of disease and death was due to contaminated water, one must feel that it was scarcely possible to over-estimate the vital importance of the proposed investigation. He expressed the hope that the alliance between the Council and the Society for this work, might be successful in bringing out practically useful results.

NOTES.

Hints on Boilers and Hot Riveting.

Some useful hints for steam-users were imparted in the paper on the construction of Lancashire boilers recently read by Mr. Samuel Boswell, of Manchester, before the Institution of Mechanical Engineers. It is not possible to reproduce the paper in full in the JOURNAL; but it deserves to be carefully filed for reference by those who may at any time require to purchase a steam-generator of this type. Mr. Boswell recommended Siemens-Martin open-hearth mild steel as the most suitable material that can now be obtained for the construction of Lancashire boilers. The strength of the plates should not be less than 26 tons, nor more than 30 tons per square inch, with 20 per cent. elongation in a length of 10 inches; the test strips being usually 2 inches wide. As to a bending test, the strip should bend cold to a radius of one-and-half times the thickness, until the ends are parallel to one another; and in the chill or temper test, to a radius equal to twice the thickness. The plates should be 3 ft. to 3 ft. 6 in. wide, and long enough to make the complete ring; so that all the longitudinal seams may be on the top. Butt joints, with double butt straps, are the best and strongest, as the plates can be bent to a true circle. Plate edges should be planed, and the rivet holes drilled; care being taken to clear all burrs. Too much care cannot be exercised in the riveting, whether machine or hand. A good way of judging sound riveting is to watch while it is being done, and notice how long the rivet remains hot. This remark applies to all sorts of hot riveting. When a clean rivet is well closed in tight, it will go black immediately, showing that the colder metal round the hole has come into direct contact with the rivet, and has abstracted the heat from it; while a slack or dirty rivet badly closed will remain hot for a considerable time. This will be seen at once by watching a good riveting machine, and then comparing notes upon a set of hand riveters who seem to be giving more attention to the appearance of the finished rivet than to its usefulness and purpose. When engaged at piece work on girders, for instance, it is astonishing how expeditiously the men can get through riveting, particularly when it is snap riveting. A few light blows from the hammer panes are sufficient to form a rough head, and then half-a-dozen blows on the snap finish the rivet while it is still at a bright red heat; but the body of the rivet has never thickened in the hole, simply because the light blows have not had any effect except just at the point where the snap head is formed. What is wanted is that the rivet shall be well forced into the hole, either by a steady pressure from a machine, or by a succession of good blows fair on the end of the rivet; and the size and shape of the head thus formed are only a secondary consideration.

Ideal Interior Lighting.

According to Mr. Nikola Tesla's idea, the perfect way of lighting a room or a hall would be by the production of such a condition in it that an illuminating device could be moved and put anywhere, and yet be lighted, no matter where it is put, and without being electrically connected to anything. He claims to have been able to produce such a condition by creating in the room a powerful, rapidly-alternating electrostatic field. For this purpose he suspends a sheet of metal at a little distance from the ceiling by insulating cords, connecting it to one terminal of his induction coil; the other terminal being preferably connected with the ground. Or else he suspends two sheets of metal in vertical planes parallel to one another; each sheet being connected with one of the terminals of the coil, and their size being carefully determined. An exhausted tube may then be carried in the hand anywhere between the sheets, or even carried a short distance beyond them; and it will remain always luminous. How far this principle is capable of practical application, the future will show. The results may theoretically be produced either by electro-magnetic induction or by electrostatic effects. The difficulty lies in producing the result of luminosity at a distance; and from certain considerations (which he mentions), Mr. Tesla is inclined to think that, if this ideal way of lighting is to be rendered practicable, it will be only by the use of electrostatic effects. For such a purpose, the most powerful electrostatic inductive effects are needed. The apparatus employed must therefore be capable of producing high electrostatic potentials, changing in value with extreme rapidity. High frequencies are especially wanted; for practical considerations make it desirable to keep down the potential. As regards the production of light, some of the results already attained are encouraging.

The Composition of Atmospheric Air.

A new determination of the composition of atmospheric air has been made by M. Leduc, who employed in this research a fresh gravimetric method. In two experiments, M. Leduc found that the percentages of atmospheric oxygen which united with phosphorus were 23·244 and 23·203 respectively. The mean of these values is 23·224, or roughly 23·23, which has the advantage of being easily committed to memory; and this may therefore be taken to represent the percentage by weight of oxygen in purified air. The composition of air by volume is given as nitrogen 78·98 per cent., and oxygen 21·02 per cent These values very nearly approximate to 79 and 21 for the percentage of the nitrogen and the oxygen. The equivalent proportions given in Box's "Practical Treatise upon Heat," which is much used as a text-book for combustion calculations, are 77·8 per cent. of nitrogen, and 22·2 per cent. of oxygen. It would therefore appear that, by the light of the latest determinations, Box's figures are too high for the oxygen, so that the quantity of air required for combustion is really slightly in excess of his statements.

Explosive Gaseous Mixtures.

It is known that a gaseous mixture will detonate, or enter into combustion slowly, according to its composition, and also according to its temperature. M. Roszkowski has studied these phenomena; and his results have been published in the *Journal für Gasbeleuchtung*. With hydrogen and oxygen at a temperature of 15° C., there was no explosion until there was a mixture of 9·7 volumes of oxygen to 1 of hydrogen. The influence of temperature up to 300° C. is negligeable. At the lower limit, at least 0·1013 of oxygen to 1 volume of hydrogen is required at 15°. At 300°, only 0·0554 of oxygen is needed. With hydrogen and air, the temperature has no influence upon the lower limit of explosion. Its influence on the higher limit is, on the contrary, sensible. At 15°, it tables 0·1147 volume; at 300°, only 0·0548 volume of oxygen will explode. With oxygen and carbonic oxide, the inferior limit at 15° is 5·4 volumes of oxygen; the superior limit is 0·066 of oxygen to 1 volume of carbonic oxide. The difference between the two limits increases with the temperature up to 200°, beyond which it diminishes. At a temperature of 300°, the limits are 3·14 volumes and 0·086 volume of oxygen to 1 volume of carbonic oxide. With methane and oxygen, the inferior limit is 0·75 volume of oxygen, and the superior limit 14·6 volumes of oxygen to 1 volume of methane. When methane is mixed with air, the quantity of oxygen necessary to explode it is nearly double that which is required when the oxygen is pure. With lighting gas and oxygen (the gas used containing at least 50 per cent. of hydrogen, 35 per cent. of methane, and 6 per cent. of carbonic oxide by volume), the limits are, at 15° temperature, 12·25 volumes and 0·435 volume of oxygen to 1 volume of gas. When lighting gas is mixed with air, the quantity of oxygen necessary to explode it is ⅓ of that taken pure. The limits are therefore 13 volumes of air, and 3·5 volumes of air to 1 volume of gas.

COMMUNICATED ARTICLE.

SOME PRACTICAL DISADVANTAGES INCIDENTAL TO THE GENERATION AND DISTRIBUTION OF ELECTRICITY TO CONSUMERS.

By Norton H. Humphrys, Assoc. M. Inst. C. E., F.C.S.

On the principle, perhaps, that "there is nothing like leather," the writer has recently been led to compare the generation and supply of electricity, or at least so much of that art as has been made public at meetings of scientific or engineering bodies, with the operations conducted by gas undertakings. The results of such comparisons are interesting to gas engineers, at any rate, as throwing some light on both the advantages and disadvantages incidental to their speciality. It is obvious that in supplying or distributing any marketable commodity—whether fluid, gas, or one of the forms of energy—from a central station, by means of conduits through the streets, to the houses of consumers, there are certain sources of loss, which may be indicated by the term "leakage." These may embrace several different factors, peculiar to the agents supplied; but all converge to the one fact—that a sovereign's worth put in at the works does not run out to a corresponding value when distributed. When weighing out a hundredweight of sugar or tea into 1-lb. packages, there is a certain loss due to the trifling overweight given on each package; and, in a similar manner, we find that, whether it is 1000 units of electricity, 1,000,000 cubic feet of gas, or 10,000 gallons of water that are sent out, the quantity actually received by the consumer, and duly paid for, is something appreciably less. This may be due to leakage, overweight, or both. The agent may be *bonâ fide* reduced in value before it reaches the user; or it may actually be supplied, but not be accurately registered. If the supply is by contract, it may be either more or less than that stipulated for; or if by meter, the machine may be either "fast" or "slow." The supplier should be sufficiently honest to strictly fulfil his obligations in the matter both of quantity and quality supplied; and, on the other hand, sufficiently skilled in his own particular line to guard against overweight, and to see that the loss by leakage is reduced to the lowest possible point.

For many years, gas and water retained sole possession of our streets, so far as distribution is concerned; but it is evident that they are not to enjoy this monopoly any longer. There is not only the supply of electricity, but also that of power, either by the medium of water or air, steam for power or warming, to say nothing of pneumatic tubes, telephone wires, &c., and other developments of underground distribution which as yet are looming in the distant future. So that the question of distribution increases in importance every day. The escape of electricity or of high-pressure steam is more dangerous than that of coal gas; while a dash of water under 700 lbs. pressure per

square inch from the hydraulic power system would be extremely inconvenient. Not only so, but the presence of each additional agent increases the common danger. With the old plan of gas-mains on one side of the road and water-mains on the other, any leakage of gas or water began and ended without affecting anything beyond itself; but a similar accident in any of our principal Metropolitan thoroughfares might only be the beginning of a series. This has been exemplified in New York, where the bursting of a steam main shattered the adjacent gas and water pipes, and broke up the electric conduits—producing an electric discharge that fired the gas. So that when gas-mains and electric conduits run side by side, we get an effect that may be illustrated by supposing a sportsman to carry his percussion-caps and gunpowder in one common receptacle. The addition of a "power" system is another factor in the chain of circumstances that would intensify the effects of a disaster. Such liability to a sinister rendering of a chapter of accidents after the manner of the events pourtrayed in the old nursery ditty of "The House that Jack Built," renders the general subject of street distribution a matter of public importance. This consideration has, no doubt, led to the suggestion, which hails from the United States, of placing the subsoil of the streets under the entire control of a Municipal Distribution Engineer, who would see that each main or conduit was so arranged as to interfere as little as possible with its neighbours.

With fluids or gases, after allowing for every tangible source of waste or overweight, there still remain minute causes that may perhaps be represented by the terms "spontaneous evaporation." With gas there is the effect of condensation (if any); the liability to changes of temperature, and the consequent effect on the bulk; and the possible existence of exosmosis through the substance of the cast-iron mains. So far, prolonged experience has enabled the practical effect of these to be determined with accuracy. In dealing with forms of energy which are of a more subtle nature than tangible substances, it seems probable that this spontaneous evaporation is likely to obtain to a greater degree. Electrical engineers are already directing their attention to the subject of "unaccounted-for" electricity. This is not such a simple matter as that of unaccounted-for gas, because the question of the distribution of electricity on a large scale is as yet open. The simple leading of lines direct from the dynamo to the consumers' lamps is held by many to be adaptable to comparatively small areas; and it is considered that the conveyance of large quantities of electricity for any great distance involves the use of high-pressure lines, with accumulators or transformers for converting the high into low pressure. This may be illustrated by supposing that the usual method of distributing gas direct from the holder to the consumer's meter was only suited to small towns, and that in large ones it required to be supplemented by trunk mains supplied with gas at a comparatively high pressure, with feeders leading into the low-pressure system at regular intervals. On each feeder a district governor would be used, to keep back the excess of pressure; and this would correspond to the transformer. But, to make the parallel good, we must further suppose that the district governor involves a considerable waste, ranging from nearly nothing under the most favourable circumstances, to about 50 per cent. at the other extreme. With gas it has long been settled that the low-pressure system is the best. The present state of the electricity distribution question may be represented by supposing that the cost of gas-mains was so great as to lead a large number of gas engineers to believe that the reduction of the first cost of the distributing plant, by the use of high-pressure trunk mains of relatively small diameter, would be more economical than that of low-pressure mains, having sufficient area to allow for loss of pressure in distributing, &c.

The material used for the conveyance of electricity in a practical way is invariably pure copper. Various shaped sections are used; and they are either surrounded with insulating material, or else laid naked, supported at intervals by non-conductors, in a small subway or conduit. In the latter case, they are, in fact, air-insulated, just like telegraph and other wires carried upon poles. It is sometimes remarked that no material is absolutely gas-tight; but gas engineers have been so fortunate as to meet with several that are practically so. Electrical engineers do not appear to have been quite so lucky in this respect; at least, so much may be inferred from the fact that some of them prefer to use conduits and insulated supports, the cost of which must be very considerable, rather than to "cover" the conductors with insulating material. With gas, the use of high-pressure trunk mains, involving also the employment of distributing stations fitted with valves, governors, &c., for regulating the distribution, is applied on a limited scale, and that only to the very largest districts. But with electricity, the necessity for distributing stations appears to come in at a much smaller scale of operations. It is only possible to touch in a general way upon this point, because, as already remarked, it is really an open question. The high-tension and low-tension systems respectively have their advocates; and further experience will lead to the determination of fixed principles in this respect, as it has done in the case of gas.

In a paper dealing with the subject of generating and distributing electrical energy, recently read before the Institution of Civil Engineers by Mr. R. E. Crompton, it was stated that, with the low-pressure system, the efficiency of distribution should not be less than 90 per cent. At Kensington, 92 per cent. had been attained for the months of January, February, and March, and 87 per cent. during the heaviest period of supply in December. At St. James's, still better results had been recorded—94 per cent. being easily reached; and 97 per cent. had been maintained for a month. At Chelmsford, the result of a year's working with the alternating transformer system of distribution was an efficiency of 83 per cent. And the author gave several reasons for supposing that, with high-pressure systems and transformers, it might possibly be as low as 50 per cent.; but this could be greatly increased by manipulation of the transformers at sub-distributing stations. At this point one is naturally reminded of the system adopted at Cork—viz., the supply of electricity from sub-stations, where it is generated on a small scale by the medium of gas-engines. This plan offers the advantage of doing away with the high-pressure system and the transformers; and if a considerable loss by leakage is a necessary feature of that arrangement, so much the better for the scheme adopted by Mr. Denny Lane.

It is not necessary to go over the old story of the various circumstances that influence the percentage of unaccounted-for gas—such as the extent of the district and the consumption per mile of main, the variation in elevation, and the effect on the supply pressure, the use or otherwise of district gasholders with the necessary trunk mains, the number of consumers and the consumption per consumer, and similar matters, which have been discussed over and over again. The means by which it has been reduced from 20 or 30 per cent. down to 5 or 6 per cent., are generally well understood. In several respects, electricians find themselves occupying a position akin to that held by conductors of gas undertakings some fifty years ago. They have a low consumption per mile of main, and a large variation between maximum and minimum supply. In the case of gas, the possibility of storeage met this difficulty to some extent; whereas it appears that if electricians wish to enjoy the advantages of storeage, they can only do so at some loss, to say nothing of a risk of failure. The gas generating and purifying plant need only be equal to the maximum *average* demand per 24 hours. The distributing plant must, of course, be able to supply the maximum momentary consumption, which will probably obtain for an hour or two in the middle of the evening. If we suppose that the gasholders were not so sound and reliable as they are—that they always involved some loss by leakage, together with risk of total collapse—things would be different. If, instead of a generating and purifying plant equal to a little less than the average daily requirement just before Christmas, it was necessary to maintain one equal to the average *hourly* production, the price of gas would be double its present rate. Take as an example the consumption between 6 and 7 p.m. on Christmas Eve, and suppose that the manufacture had to keep step with it. The works would have to be twice as large as is now sufficient; and there would be an enormous addition to the working expenses, represented by a reserve of retorts kept ready for use, and men in waiting to serve them when required. That this is about the position of electricity at the present time is shown by the fact that Mr. Crompton points out that if the loss on storeage is 20 per cent., and only one-fifth of the total production of electricity is allowed to pass through the accumulators, the actual loss is only 4 per cent. of the whole—a trifle as compared with the saving effected by the use of this form of storeage.

(*To be continued.*)

The Late Mr. J. K. Watson.—In the notice of the late Mr. John Kippen Watson which appeared in the JOURNAL for the 24th ult., reference was made to his long connection (extending to 52 years) with the Edinburgh Gaslight Company. It may be interesting to record the fact—probably without a parallel in the history of gas lighting—that Mr. Watson's father, whom he succeeded in the office of Treasurer and Manager, was with the Company 41 years; so that, between them, they were in the service (part of the time concurrently) for no less than 93 years.

Explosions of Coal Dust in Mines.—In the course of a lecture recently by Professor Harold B. Dixon, at the Owens College, Manchester, on "Coal and Coal Mining," he directed attention to the evidence which has been accumulated regarding the action of finely-divided coal dust either in promoting or aggravating the intensity of explosions produced by fire, or, on the other hand, by igniting itself, and causing an explosion in mines. He said the question which was being considered was this: Is dust capable of creating a flame when it comes in contact with a large flame such as may be produced by a blown-out shot or by an explosion of gas and air? It was not supposed that an ordinary naked light in a mine would suffice for an explosion of coal dust and air. There must be first a great disturbance to raise the dust, and mingle it with the air, to make it an explosive mixture; and there must be a great heat locally applied to initiate the explosion. But when once this had been set up, a flame might extend so far as there was the coal dust lying on the floor or sides; and the damage done by it was comparable, at all events, with that caused by an explosion of fire-damp and air. This was a view frequently urged; and, in support of it, the lecturer tried a few experiments. He showed that fine dust falling on a flame will give off flame and sparks, and that when mixed with oxygen an intense flame is produced. The difficulty, he added, was to obtain the requisite proportions of coal dust and air to make an explosive mixture.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

In last week's JOURNAL, we gave a very brief account of the Eighty-Eighth Quarterly Meeting of this Institution, which was held on Saturday, the 28th ult., at the Grand Hotel, Manchester; and we now publish the full report of the proceedings. The PRESIDENT (Mr. T. O. Paterson, of Birkenhead) occupied the chair.

THE PRESIDENT OF THE GAS INSTITUTE.

The PRESIDENT, having expressed regret at the fact that bad weather had made the attendance smaller than usual, and pointed out that they had a very good programme, said he wished, in the name of the Institution, to give a hearty welcome to Mr. W. A. Valon, the President of the Incorporated Gas Institute. Mr. Valon was overwhelmed with parliamentary and other business; and the fact that he had found time to pay the Manchester Institution a visit was one on which they must congratulate themselves. Their hearty thanks were due to him for being present at the meeting.

Mr. VALON, who was received with applause, returned thanks for the heartiness of the welcome extended to him, and said it would give him a great deal of pleasure to be at the Institution meetings from time to time, if business engagements did not prevent it. He hoped to be with them again on some future occasion; and he hoped also to see the members of the Institution in London at the next meeting of The Gas Institute, and there he would give them as hearty a welcome as they had given him that day.

THE MINUTES.

The SECRETARY (Mr. S. S. Mellor, of Northwich) read the minutes of the last meeting, held at Birkenhead on Aug. 29, which were confirmed, on the motion of Mr. C. ARMITAGE (Lancaster), seconded by Mr. W. SMITH (Hyde).

A number of letters of apology for non-attendance were also read from absent members.

NEW MEMBERS.

Mr. J. W. Buckley, Manager of the Formby Gas-Works, was proposed for election as a member of the Institution, by Mr. E. LORD (Whitworth), seconded by Mr. J. COCKCROFT (Littleborough). Mr. J. Wilkinson, of the Pudsey Gas-Works, was proposed by Mr. W. DUFF (Morecambe), seconded by Mr. W. FOSTER (Nelson). Both gentlemen were elected.

ELECTION OF PRESIDENT.

The next business was to elect the President for the year commencing in February next.

The PRESIDENT said he had pleasure in proposing that Mr. Charles Armitage, of Lancaster, be elected to the position; and he was sure that his nomination would be received with the utmost satisfaction. The interests of the Institution and of the gas industry would benefit by the crisp management and advanced knowledge of Mr. Armitage.

Mr. W. W. HUTCHINSON (Barnsley) said he had very great pleasure in seconding the proposal. Mr. Armitage had two or three claims to this honour at their hands. First, he hailed from the town which was the capital of the county, though it was a little overshadowed by the magnitude of Manchester and Liverpool. Then his well-known ability in chemistry and other matters connected with the gas industry gave him a claim upon them. He had dived deep into these matters, and more over had a splendid record in regard to reductions in the price of gas at Lancaster—a fact which showed that he had not only knowledge, but had applied it in a commercial direction.

The resolution was carried by acclamation.

Mr. ARMITAGE thanked the members for the honour conferred upon him, and the mover and seconder of the resolution for their kind remarks. He said his seeming apathy in the past proceedings did not entitle him to the position which they had decided he should occupy. He accepted the post with a certain amount of diffidence, notwithstanding the confidence which the members entertained of his abilities, which he submitted were infinitesimal. He would, however, endeavour to fill the position, and successfully perform the various duties appertaining to the office, if only to maintain their confidence, and the dignity of that most useful Institution. He must, however, rely upon the hearty support of the members, which he felt certain they would not fail to accord. He again thanked them for their kind expressions, and trusted his year of office might be very fruitful, and of mutual advantage to the members and to all engaged in the important branch of industry to which they had the honour to belong.

DIFFERENTIAL RATES.

A discussion then took place on the paper which Mr. T. NEWBIGGING (Manchester) read at the previous meeting, on the subject of "Differential Rates" (see *ante*, p. 396).

Mr. ISAAC CARR (Widnes) said that local authorities possessing gas-works were quite justified in charging a higher price for gas sold outside the limits of their district than they charged for that consumed within it. As the author of the paper pointed out, it had been argued that there was no real risk in owning gas-works, and that, on the ground of risk, authorities were not entitled to make any extra charge. But if this were so, there was no gainsaying the fact that there was an extra cost for distribution in distant and straggling districts. This cost was necessarily much higher in such places than in towns where the streets were all built upon. Then the cost of maintenance was also higher. At Widnes they had an outlying village some four miles from the boundary of the town; and the expense and maintenance there was almost double that in the borough, on account of the time taken up in the transit of men and materials. A further additional cost was also incurred in index-taking and the collection of accounts. All these were good reasons why an extra charge should be made for gas supplied outside the limits of the local authority. He did not know what was the practice of gas companies; and it would be very interesting if gentlemen having charge of companies' works would tell them. Of course, with the exception of the liability of the ratepayers, gas companies were in exactly the same position as local authorities in supplying gas to distant places. Oldham was an exception to the rule, and was a place where the differential rates were not allowed. He did not know why this should be so. It appeared to him that a gas-works was like any other mercantile concern. If it was an advantage to the owners to erect the works outside the limits of their own district, they were obliged to discharge their liability for rates and so on in the district in which the works were situated; and after that liability was satisfied, he failed to see the justice of putting another tax on the undertaking by refusing to allow them to charge an extra price for gas. At Widnes they had works outside the boundary of the local authority's district; but if the people of the out-district wanted gas at the same rate as those within the borough, he thought they would be at a loss to find any reasonable argument for the application.

Mr. C. A. CRAVEN (Dewsbury), who was next called on by the President, said he was somewhat at a disadvantage in not having heard the paper. He might, however, say that the Corporation of Dewsbury did not charge a differential rate. About 20 per cent. of their consumption was entirely outside the borough limits; and they made no difference whatever in the price. In the adjoining borough of Batley, there was a difference of 5d. per 1000 cubic feet between the price inside and outside the borough. Comparing the two practices, he preferred their own, because they hoped that at some time the out-districts would decide to become incorporated. They were a little concern at present; but when the out-districts saw that Dewsbury treated them fairly and liberally, they would eventually want to join the borough.

Mr. W. W. HUTCHINSON said he felt a little disappointed with the paper. He had hoped Mr. Newbigging would have treated of different kinds of differential rates. He should have liked to have heard that gentleman's opinion as to varying prices for gas. At Barnsley they had a sliding scale according to consumption; while a neighbouring borough had one price for all consumptions whether large or small. They might have threshed out the question which was the right course in this matter. Then he also hoped to have heard some expression of opinion with respect to a differential rate in the summer months. In order to give satisfaction to the public, they had to expend a large amount of capital on works which were very fully employed in winter, and not so much wanted in the summer. They should aim at getting such a consumption as would keep the whole plant continually at work; and he could understand that it would add to the prosperity of an undertaking to make a substantial reduction of price in the June and September quarters. In order, however that the consumers might take advantage of this without clamouring for more, they must, of course, have a calm state of things in the town; or else it would be said that gas could be produced at less cost in the winter than the summer, and so ought to be sold for less. There was also the question of the differential rate for gas used for particular purposes—such as gas-engines and cooking-stoves. A different price was charged in many towns for gas used for these purposes; and he should have liked an expression of opinion with regard to the wisdom or unwisdom of this course.

Mr. T. DUXBURY (Darwen) said that in his case all the gas was consumed within one township; and they charged one price throughout. He happened, however, a few years ago to be in the position of wanting to buy gas from Blackburn; and it would seem to argue against the opinion propounded by Mr. Newbigging, when he told them that (though Darwen thought it was treated rather hardly) the Blackburn Gas Committee supplied them at the same rate as they were charging their very biggest consumers—the millowners—in their own town. As to the case of Dewsbury, he expected if it became a question between Batley and Dewsbury, which could supply a certain township, the one that offered gas at the cheapest rate would get it. At Darwen, they had four prices. There was first the price charged to ordinary cottage consumers. Below this was a reduction of 3d. per 1000 cubic feet to larger consumers; and an additional 2½ per cent. discount to the largest consumers—the millowners. And, besides these, they had the price of gas used for gas-engines and cooking, which was 1s. per 1000 cubic feet less than the ordinary rate. In connection with the allowance to millowners, a rather singular claim crept in. All the millowners claimed to have the gas consumed at their residences added to that used at the mills, and to have the whole of it at 3d. per

1000 cubic feet below the ordinary price, and with the discount of 2½ per cent. Then the millowners' sons came in, and claimed to be partners, and to be put on similar terms. Next they had the shareholders in limited companies (200 or 300 in number); and they claimed the same privilege. How far the thing would have gone, he did not know; but the Gas Committee did not allow this last claim—though certainly, in a sense, they were all partners in the concern. The wisdom of their reduction to the largest consumers he very much doubted; for the capital of the concern had to be increased to supply the millowners in winter, and all this plant was idle in summer.

Mr. NEWBIGGING suggested, before the discussion proceeded further, that they should leave the question of other differential rates on one side altogether. It would be better, he thought, to discuss his paper from the point of view which he had taken himself. There was ample scope for another paper on differential rates of another kind; and it would be far better to leave the discussion on that head until the paper was read.

The PRESIDENT agreed that there was certainly scope for another paper, and perhaps Mr. Newbigging would furnish it for them.

Mr. W. A. VALON (Ramsgate), who was next called on by the President, said he did not read the paper at the time, and had not seen it before he had had it put into his hands a moment or two ago. Therefore it would only be a remark or two which he should pass on it; and that would be what was in his own mind independently of any opinion he might hear afterwards or that might be in the paper itself. He did not quite see the policy of a company or corporation charging a differential rate in the sense which Mr. Newbigging advocated—namely, to charge consumers because they lived a certain distance away a higher rate or a lower rate, as the case might be, than those who lived within the circle of their own borough. His (Mr. Valon's) reason was that the corporation or company, when they went to Parliament, asked to be allowed to supply the out-district. They got the permission and privilege to do that—it was a privilege—and he could not see why one consumer, who lived (say) three miles from the gas-works should get gas at 3s., while another, who lived a few miles further off (beyond an imaginary line), was charged 3s. 3d. It might be that the district further off was a populous one; and it was hard that the consumers there should be charged extra. If they extended the area of the cheaper supply to include the populous district, he imagined that the case of another district a few yards beyond that became equally hard. He considered it desirable that one uniform rate should be charged throughout a district.

Mr. W. S. HADDOCK (Warrington) said that, in the neighbourhood of Warrington, they had a number of small villages, and charged a differential rate of 6d. per 1000 feet per mile of main beyond the limits of the borough; and even at that price, they would prefer not to supply the out-districts with gas. In some cases they had a couple of miles of main doing nothing except carrying the gas to the outlying districts. As had been said, the cost of repairs and so on was higher than in the town, because the time occupied going to-and-fro was longer, and there were omnibus or tram fares to pay. If a company or corporation were supplying a town, it was all very well to have one uniform price; but if the works were in a growing district, as theirs were at Warrington, it was impracticable. They did not know when the works were laid down which way the district would extend; and if they had not had a differential price, they must have had a fresh Act of Parliament every time they took in a fresh district. The differential price was an advantage to the Corporation; but not so great as appeared on the face of the figures. As the districts grew, the consumers would go in for a reduction in price; and it was quite right that they should have it where the mains became productive.

Mr. W. R. CHESTER (Nottingham) remarked that if they all did as Warrington was doing, and charged a differential price of 6d. per 1000 cubic feet per mile of main, they would be able to congratulate themselves. In his own case, it would add no less than 4s. 6d. per 1000 feet to the price of the gas. They had at Nottingham no less than 24 villages, which were supplied with gas at the price charged to the largest consumers in the borough of Nottingham. That seemed now a great hardship; though there was a time when the Corporation felt it so desirable a thing to acquire the gas-works, that they consented to forego the differential charge which had previously existed, and agreed to supply the villages at the same price as the large consumers in the borough. In many respects, no doubt, these districts were supplied at greater cost than the borough could be supplied at. There was more expense in distribution, in repairs, in collecting the accounts, and so on. At the same time, they had to consider what would be the position of the gas-works in towns if these districts were cut off from them. The gas supplied to them helped to materially reduce the permanent charges; and if they were in his own case to cut off the whole of the out-town districts at one blow, they would lose something like 187 million cubic feet, or one-eighth of the total consumption. This would largely increase the fixed charges on the cost of the production of gas; and they would not be able to supply the borough at as low a price as they were now able to charge. At the same time, they ought to take a reasonable view of the matter; and if they were in a position to charge a moderate sum in excess of the price in the borough, he did not think the outside districts would raise any objection to it. It was only when corporations—which were quite as sharp as companies in looking after their own interests—added an enormous amount to the sum charged in the borough, and then took every opportunity of spending out of revenue money which should be charged to capital account, that difficulty arose with the outside consumers. They had, not far from Manchester, a borough which did this to a very large extent; and the result was that, when they came to be opposed in Parliament, they had to accept an altogether different state of things. They were forced to supply the outside districts at the same price as the inside, because they had been piling up works out of revenue. If corporations would only be reasonable, he thought there would be no difficulty in connection with the outside consumers, who would pay a small extra charge of 2d. or 3d. per 1000 feet; and this would perhaps be quite sufficient to cover the extra cost of distribution. This question of differential rates was very much wider than Mr. Newbigging's paper embraced; and it would always afford a large amount of interesting discussion. He did not think it necessary now to go into the question of different charges of this kind; though there were two sides to that question, and he should not be inclined to take up the side for a differential rate for motive power and so on.

Mr. R. HALL (Matlock Bridge) said he was Manager for a small Company which supplied gas in the district of four different local authorities. They had no differential rate—they charged all alike; and any attempt to enforce a differential rate would cause a great hubbub. Small companies had always to bear in mind the necessity of continually increasing their consumption. If they could increase the consumption, they decreased the cost of manufacture; and if they could see that the revenue for laying a main was sufficient to cover the cost, it paid them to do it.

Mr. CARR rose again to say that he did not agree with the conclusion of Mr. Chester with regard to supplying outlying districts.

The PRESIDENT ruled that Mr. Carr was out of order; and then went on to say that, whatever difference of opinion might be expressed as to the subject of the paper, there was only one opinion as to the paper itself—namely, that it was a good one, and that they had learned something valuable from it, which they did not know before. He thought the question of liability should be more thought of than it had been by the speakers. The liability was certainly thrown upon the borough where a corporation owned gas-works. Whatever might come henceforth must be borne by the ratepayers. The outlying districts had no liability whatever; and looking at it simply in that way, he thought the out-districts ought to pay something extra. At Birkenhead, they charged a round sum of 6d. per 1000 cubic feet extra to all outsiders. Their revenue for gas sold in the borough was £53,087, which was equal to £646 per mile of main; and in the out-districts, they received £3874, or £250 per mile of main. Of course, size of mains and amount of capital expended had to be considered; but on the face of it, there was nearly two-and-a-half times more revenue from the town mains than from the mains in the out-districts. In the borough they sent out 4½ million cubic feet of gas per mile of main per annum; in the out-districts it was only 1½ millions. They had 15 per cent. of their total length of mains outside the borough, and had only 6 per cent. of their gas sold outside. The borough had considerable capital lying there; and the ratepayers' liability was covered by the extra 6d. per 1000 cubic feet, which he did not think an excessive charge at all.

Mr. NEWBIGGING, in reply, said he was very pleased with the remarks which had been made on his brief paper; and he had no doubt the discussion would be extremely useful—perhaps more so than the paper itself. Some disappointment had been expressed that he did not take up the whole subject of differential rates. The fact was the paper was written at the request of the Honorary Secretary, because some of the members who had promised papers for the previous meeting failed to keep their promises. However, he did not offer this as an excuse, for he thought there was ample room for discussion on this particular branch of the question; and it was a good thing not to use up all their material at one sitting. He did not promise to read a paper on the other branches of the subject; but he hoped some members would take up the subject and give them one at a future time. Mr. Carr had maintained that the added cost of collection, maintenance, and so on, was a justification for a differential rate; and he (Mr. Newbigging) agreed with him. It was not just to the people in the borough, who had the responsibility of finding the capital, that they should be mulcted in a certain sum to supply outside consumers. The case of Oldham had been mentioned; and he (Mr. Newbigging) agreed with Mr. Carr that it was not fair that the differential rate should have been done away with. They must remember that Parliament was all-powerful, and might do right or wrong. It was not always a question of which was right, but of what they could obtain; and it did not follow, because Parliament said they should not have a differential rate, that it was not right to do so. Mr. Craven had stated that he did not charge a differential rate; but he explained that, by way of a bribe, he supplied the out-districts at the same price as those inside, in order to induce them to become part of the borough. This was one way of looking at it; but he did not know that Mr. Craven's constituents would exactly agree that this was the proper thing to do. Mr. Duxbury mentioned that, when he was in difficulties,

he obtained a temporary supply from Blackburn; and he argued from the fact that Blackburn only charged the same price as to their own large consumers, that if they had had to supply Darwen they would only have charged that rate. He (Mr. Newbigging) did not think this was so. [A MEMBER: Who paid for the main?] Darwen, he believed, paid for the main, and the gas was sold in bulk. It would have been a different case if the Blackburn people had laid all the mains through Darwen. Mr. Valon was labouring under the disadvantage of not having read the paper. He (Mr. Newbigging) was sorry for this, because any opinion coming from him must have great influence. Mr. Valon did not see the wisdom or the propriety of charging a differential rate to consumers because they happened to live a distance away. This was not the reason for charging such a rate. It was not because they were a distance away, but because the outside districts were usually scattered, the cost of maintenance and repairs was heavier, and they had no responsibility with regard to providing capital for the undertaking.

Mr. VALON: On the other hand, they get more of the profit.

Mr. NEWBIGGING said he had met this point in his paper, where he had explained that a reasonable differential rate should be charged. He did not at all agree with making an unreasonable profit, such as Mr. Chester had alluded to. Mr. Valon further said that Parliament gave power to supply a particular district. So it did; but it also allowed the differential rate.

Mr. VALON said this was not what he intended to convey. What he said was that a district was asked for, and was granted because it was asked for.

Mr. NEWBIGGING admitted that this was so; and they asked, he said, for a differential rate, and they had it. He did not see the difference. Mr. Haddock had furnished an argument for a differential rate in saying that the cost was increased in the out-districts; but he very justly remarked that, as the districts increased in population, they would expect a reduction. So they would; and, if the corporation and their engineer were reasonable, it would be granted. Mr. Chester felt it a hardship that he could not charge a differential rate. It certainly was unfair. It was a hardship and an injustice to the consumers in the borough that they should both find capital and have to pay more for their gas in order that outside consumers should have it at a less price. He (Mr. Newbigging) was in favour of a reasonable differential rate, with a resonable profit to compensate for the risk which the ratepayers ran. They must assume that there were risks in face of the competition of electricity and oil. Mr. Chester also said that they could not charge a differential rate, because these districts might be cut off if they did. Why should they be? Salford was threatened with the loss of some of its out-districts; but this was a voluntary act on the part of Salford, and was not a course he should recommend. The proper thing was to charge a reasonable rate; and then there would be no danger of the district being cut off. He was glad to hear the experience of Mr. Hall, because it gave him the chance of explaining. In the case of a company, the whole population of a town was not liable for the capital. He was glad that the President agreed with him that a differential rate was justifiable; and he furnished an excellent argument for that opinion. The consumption per mile of main beyond the borough limits was only one-third what it was inside; and it would be very unfair to supply those outside at the same rate as the people in the town itself. He (Mr. Newbigging) had not heard a single argument which had convinced him that a differential rate was wrong in a thickly-populated out-district.

This closed the discussion on Mr. Newbigging's paper; and Mr. West then read a paper, "On Stoking Machinery, &c.," which appears to-day in another column. The report of the discussion on this we purpose giving in next week's issue.

AMERICAN GASLIGHT ASSOCIATION.

The Annual Meeting in New York.

(*Continued from p.* 943.)

At the close of Mr. Nettleton's reply to the discussion on his paper on "Leakage," Mr. Walton Clark, of Philadelphia, followed with one on "Meter-Rents: A Question of Equity and Policy" (see *ante*, p. 990). The discussion on this paper was opened by Mr. A. G. Glasgow, who observed that the writer proposed to use meter-rents as a means of solving the much-discussed question of differential rates for gas according to the quantity consumed. He thought no one would dispute the proposition that each consumer should pay an equal rate of interest on the investment necessary to serve him. This was as obvious as that everyone should be equally rated or taxed. He, therefore, wished to put himself on record as supporting Mr. Clark. As a question of policy, also, he agreed that it was right; and he went on to expose the fallacy of supposing that the spare capacity of existing plant might be filled by business at a lower rate of interest. What, he asked, became of such a policy when extensions were necessary; and where was the point of selling to anyone at a price that would not give a fair interest on capital? He was satisfied that every gas company had a considerable number of small consumers to whom they were monthly handing out a certain amount of money for the pleasure of allowing them to keep a meter and occasionally use a small quantity of gas. Some had adopted a plan of sending a bill for a definite quantity of gas whether it was used or not; but this was an arbitrary way. The plan under discussion was both practical and just. Mr. Clark explained that all that would be necessary for the adoption of his plan was a table showing the cost of placing and maintaining different sizes of meters and services, from which the charges could be worked out. Mr. Littlehales agreed with the policy of charging meter-rents.

Dr. A. W. Wilkinson, of New York, next read a paper on "Lime." After introductory remarks on the nature of lime, the author proceeds as follows:—

Soon after the discovery of gas-making by Murdoch, lime was suggested as the best substance for its purification, or to free it from its bad smell. It was well known that whitewash in some way purified the air of the room in which it was used; but the chemistry was unknown. The fact that lime would thus act led to its use as a purifier of gas—first in a liquid form, or cream of lime. In this shape it did its work very effectually—in fact, too well; for often many of the illuminants would be washed out. The fact that the lime becomes very offensive in removal led to its discontinuance, and the substitution of lime in a comparatively dry state, such as we are now familiar with in all our works.

Many substitutes for lime have been offered for purifying gas; but they have failed to meet all the requirements in effective work, or come within the limit of cost. The only one that has at all become popular is the hydrated oxide of iron, and this only in part fulfils its mission. Lime will filter the gas, and absorb the sulphuretted hydrogen and carbonic acid. With iron, we can only do the first two—allowing the carbonic acid to go free, to the great injury of the quality of the gas, by causing it to burn with a reddish light, with a tendency to smoke. Carbonic acid is a regular "dog in the manger;" it will not burn itself or let the other combustible gases burn. Many engineers who use iron for purification, make up the loss of light by using a little more of the enricher, whether cannel coal or oil; but this method is never quite satisfactory—the oxide's recommendation being its cheapness, and the enormous quantity of gas it will purify. The place for the iron is before the lime; that is, pass the gas first through the iron, then through the lime.

At the present time there is a great competition in light, and this compels the gas engineer not only to give a volume of light, but light of a fine quality; and lime—the good old and faithful servant that has been with us since the beginning—can do more to secure this than any one thing. Help it, if you choose, with iron; but do not try to do without the lime.

It has been often asked how much gas a bushel of lime ought to purify. When properly slaked—that is, converted into a hydrate—28 lbs. of pure caustic lime will combine with 22 lbs., or 188 feet, of carbonic acid. The same weight of lime will combine with 17 lbs., or 188 feet, of sulphuretted hydrogen. But these figures are of no practical use, for the reason that we never have pure lime rock, or shells, or marble; and it is often imperfectly burned, or imperfectly slaked, or has been exposed to the air and already absorbed carbonic acid, and possibly sulphuretted hydrogen. Then the boxes may not be of the best form, or the lime have been properly put in; and then again we have the gas with a greater or less percentage of impurities. So that, to give the exact amount a bushel of lime will purify, you will require to know all these facts.

Some engineers think that lime should purify the same quantity of gas, no matter what may be the condition of the gas. For instance, coal will be purchased that contains 5 per cent. of sulphur; and, when subjected to distillation, this is sure to give off sulphuretted hydrogen, bisulphide of carbon, and sulphide of ammonium in large quantities. Again, the coal will be used wet, or often covered with snow and ice. Such coal will make large quantities of carbonic acid; and the amount of lime for purification will be proportionately increased.

With your permission, I will suggest what would be an ideal plant for making coal gas—plant that would give the lime the best chance for effective work: (1) A bench so well set that the retorts shall be uniformly heated, whether by an ordinary or a regenerative fire, to a high heat. (2) The coal should be a good caking coal, as free as possible from sulphur, and dry; that is, it should be kept well housed, for coal exposed to the elements rapidly deteriorates. (3) As high heats should be employed as can be maintained without producing pitch in the hydraulic main. (4) The exhauster should be run so as to keep as near zero in the retorts as possible; for to produce a vacuum in the retorts, the risk is run of drawing in furnace gases, and a pressure means less yield. (5) The condenser should be ample, so as to cool the gas gradually. In a small condenser the gas rushes through so rapidly that much tarry vapour or oily compounds escape condensation; going over to foul the pipes and other apparatus and coat the lime, preventing it from absorbing or combining with the carbonic acid or the sulphuretted hydrogen. (6) Condensers are almost always too small. Perhaps they were large enough when first constructed; but the growth of business soon overworked them, and no provision is made for extension. (7) Next, the scrubbers, for here a most important part of the purification takes place. Experience has taught that to wash with pure water is to injure the illuminating power; to pump the water

over and over again until it is saturated with the chemical compounds, is less expensive, and produces better results. A cubic foot of water will dissolve 480 cubic feet of ammonia; the carbonate of ammonia which is formed by bringing the ammonia and carbonic acid together is also dissolved, as well as the sulphide of ammonium, all of which it is very desirable to remove from the gas. (8) We now have the gas in such a shape that the iron, the use of which I should most strongly advocate, will combine with the sulphuretted hydrogen freely; one box being sufficient to do the work for many thousand cubic feet daily. Finish with the lime, which, having only the carbonic acid to take care of, will do enormous work—surprising many who have been in the habit of neglecting the points I have mentioned.

Coal gas made and purified in this way is as pure and white as can be desired; but it is limited in its candle power—16 to 18 candles is as much as you ought to expect. It is better for heating and cooking, or for motive power; containing, as it does, more heat-units than any other gas. If you want more luminosity, instead of loading it up with naphtha vapour which will give the increased candle power and at the same time change the quality of the light—making it reddish, and with great tendency to smoke—go directly to water gas. Here it is easy to get a 30-candle gas pure and white. If this is too high, a mixture of the two in equal parts is most satisfactory.

As I have followed the making of coal gas from the retort to its final purification, it may be as well to do the same with water gas as made in New York. The first step in the operation is to produce the non-illuminating water gas. For this purpose we require a cupola—an iron vessel from 6 to 8 feet in diameter, 12 to 18 feet high, lined with fire-brick—into which we place coal, and set it on fire, with a suitable blast. We bring the coal to a full white heat, then shut off the air, and close the outlet of the products of combustion, open the valves leading to the hydraulic main. and turn on steam, which will be rapidly decomposed into carbonic oxide and hydrogen. These gases are forced into a holder, whence they pass to the illuminator—a vessel so arranged that the gases become thoroughly mixed with the vapour of naphtha in such quantities as will produce the candle power desired. From the illuminator the gases and naphtha vapour pass to the through retort heated with oil or coal—entering at one end, and being converted into a perfect gas in the passage through. The exhauster sends it through the condensers; and the same care should be observed as in condensing coal gas. A scrubber is not really needed, for there is no ammonia, and very little sulphurretted hydrogen to dissolve (a dry scrubber that will cause friction of the gas is well, but not a necessity). It is now ready for the iron and lime boxes. With naphtha, 4½ gallons will give 30-candle gas.

At the Mutual Company's works in New York, we have for years been re-burning the spent lime. It is first pounded into bricks, and then burned into caustic lime in kilns, the same as used for burning brick. The cost for a bushel of slacked lime is from 3c. to 4c. There seems to be no limit to the number of times the lime can be reburned; and it will purify just as much gas as when first burned. This places lime in the hands of gas engineers at a price which enables them to use it constantly, and make a gas that will not only compete with electricity, but be vastly superior in brilliancy and cheapness. Whenever you hear that electricity is making rapid strides in a place, you may be sure that the gas is poor or badly purified. We have a grand future for gas of high grade. The day for poor gas has passed; and the manager who is content to make a gas that will burn, no matter how—red, yellow, or smoky—will find his occupation gone. There is no excuse for poor gas at the present time. Material of the best is at hand; the science of gas making is well known. The public demand good and pure gas; and this can only be produced by proper purification with lime.

Discussion upon the paper having been invited,

Mr. A. S. Miller said it was generally admitted that milk of lime absorbed some of the illuminants from gas; and he wished to know if dry lime also did not do so. Speaking from memory, he thought some tests were made about three years ago, with gas containing 2 per cent. of carbonic acid, as to the comparative values of oxide and of lime as purifying agents; and it was found that, although the lime removed the carbonic acid, it also took out so much of the hydrocarbons that the illuminating value of the gas was not more than that of the portion which had been passed through oxide, and which still retained the carbonic acid. This was the case in his own experience. He was now using oxide only, and was getting as good results per gallon of oil as when he employed lime entirely. Mr. Walton Clark remarked that lime prepared for the purifiers was not a pure hydrate, but carried a large quantity of water with it; and he had been taught to believe that the more water the lime would hold, the better would be the purifying effect. He said that Mr. Blodgett showed, at the last meeting of the Association, that there was a greater loss of illuminating value by the absorption of hydrocarbons, when lime was used, than with oxide; and there was no doubt that lime did exercise a considerable depreciating effect in this way. A gentleman had told him that gas lime which had been used might be thrown into a retort, and good illuminating gas extracted from it. His experience was similar to that of the previous speaker, as it showed that gas that was purified by oxide was quite as good as lime-purified gas. Mr. T. Littlehales said he thought that, where lime was used exclusively, a large portion of sulphide would remain in the spent material; and that in re-burning such lime a considerable nuisance would be occasioned by the sulphurous fumes. It was the late Mr. Forstall who showed the Association the advantage of having the lime as wet as possible; and it must not be forgotten that water in itself was a valuable purifying agent. He still held to the principle of having the lime as wet as practicable. Lime had a greater affinity for carbonic oxide than for sulphur; and if it was used before oxide, it would drive forward all the sulphuretted hydrogen, and take up carbonic acid only. That was his experience at Hamilton, where during the past year it had only cost him £10 for lime to purify 30 million cubic feet of gas. If he had not employed oxide for the sulphuretted hydrogen, it would have cost a great deal more. Mr. F. Bredel said that lime had no affinity whatever for gaseous illuminants, and any of those substances deposited in it must be in the form of vapours, which would, in any case, be lost in the holder or somewhere in the pipes; so that there would be no absolute loss. This explained how it was that the illuminants were absorbed in the wet-lime process; and if the lime was thoroughly dry, the vapours would not be so easily deposited. Mr. Neal remarked that it had been recommended not to use pure water in the scrubber; but if they discontinued it, how, he asked, was coal gas to be freed from ammonia? Mr. C. F. Pritchard said that some years ago he made very careful experiments, and arrived at the conclusion that neither lime nor oxide of iron would absorb any appreciable quantity of hydrocarbons from pure gas. Mr. A. E. Boardman, referring to the process for re-burning lime suggested in the paper, said he understood that it was a question of the first cost of lime. If this was more than 2d. per bushel, it was a saving. Mr. A. B. Slater remarked that he had tried re-burning lime, and found that, when the lime cost 5½d. per bushel, he could not re-burn it with advantage. Lime containing carbonic acid only could be re-burned several times; but if much sulphur was present, it could only be treated two or three times. Mr. Baxter said that with him the cost of lime was 1s. 10d. per bushel; and the spent lime was worse than valueless. He adopted the re-burning process, and it was a success, though he did not know exactly what was the cost. The apparatus had been in use for two or three years, and, so far, the cost for repairs had been very little. One man was able to keep a double set of apparatus going, and also to slake and prepare the lime. He had 1 foot thickness of lime and 3 feet of Irish bog ore in each purifier; the gas going through the lime first. He had tried using the oxide first, but did not find any advantage; and as it was not convenient in filling the boxes, he adopted the present plan. The gas was well scrubbed before reaching the lime, and probably contained, at the inlet of the purifiers, 1 per cent. of carbonic acid, which was practically all removed. There was a large proportion of sulphur to deal with; and this was why so much oxide was used. When lime was required for building purposes on the works, he used the re-burned lime, as it made excellent mortar, as hard as cement. Some of the lime he was using had been on the works for three years in regular use; and he did not find its purifying capabilities affected in any way. He was therefore well satisfied with the system. It would not, however, be suitable if lime were used entirely; and therefore he employed oxide of iron to take up the sulphuretted hydrogen. Mr. F. C. Sherman asked for some further information as to the saving effected by using oxide as well as lime—in other words, he wished to know how much less lime would be sufficient for removing carbonic acid only than would be required to take out the whole of the impurities. He said he had to deal with gas containing 2½ per cent. of carbonic acid; and he found that just as much lime was required, whether or not he used oxide. In his case, as much lime was needed to deal with the carbonic acid only as for the whole of the purification.

In replying, Dr. Williamson said the hydrate of lime had no effect whatever upon illuminating gas, but that water would take up 6 per cent. of such gas. Therefore it was not the lime that injured the gas, but the water. With dry lime, any deposition of hydrocarbons would be entirely mechanical; and all excess of water was unnecessary, and should not be used. Oxide of iron always contained water—probably as much as the lime, as generally used. At the New York Mutual Gas-Works, they made water gas, and had a very small proportion of sulphur to deal with; but the gas was passed through oxide of iron before the lime. So that in re-burning there was no risk of nuisance from sulphur, nor did sulphur accumulate in the lime. This had been proved by analysis; and after re-burning from 300 to 400 times, the lime would purify as much gas per bushel as it did at first. The wet-lime process would seriously reduce the quality of either coal or water gas. Every gas engineer knew that it was better to wash the gas with ammoniacal liquor than with water. It was six years since he commenced re-burning lime. The process included about 16 hours' heating, and the cost was 1½d. to 2d. per bushel. It was just like filling a sponge with water, squeezing out, and filling again. The compounds of lime were definite; 28 parts of lime would combine with 22 parts of carbonic acid. But lime combined with sulphur would not be also available for carbonic acid; so he did not see how it was possible to purify as much gas from sulphuretted hydrogen and carbonic acid as from carbonic acid only.

(*To be continued.*)

ON STOKING MACHINERY, &c.

A Paper read by Mr. John West before the Manchester District Institution of Gas Engineers, Saturday, Nov. 28.

The author commenced by stating that, on being asked by the President to read a paper giving the members some information specially bearing upon his manual power machinery for drawing and charging retorts for small and moderate sized works, he at first begged to be excused; but eventually consented, on the understanding that he should be allowed to introduce other matters connected with the subject which might present themselves to his mind. He then proceeded as follows:—

No doubt most of you will have seen a paper I read before the North British Association a short time ago,* when I went fully into the question of machinery, and laid a number of important statistics before the Association; and only a few days ago another paper was read before the Southern District Association by Mr. Joseph Tysoe, of the South Metropolitan Gas-Works, East Greenwich, which dealt almost solely with the power machinery. I do not, therefore, think that it will be necessary for me to go over the whole of the ground again. The title of my paper would have been better expressed had it read: "A Paper on some of the Means employed for Reducing the Cost of the Manufacture and Distribution of Gas, and on Popularizing its Use;" and I think I shall be able to show that these subjects are very intimately connected with stoking and other machinery.

I believe you will all agree with me that this is a progressive age, and that it will not answer—especially in the profession or business in which we are all engaged—to rest on our oars; and although I am well aware that much has already been done to increase and popularize the use of gas in various quarters, by holding exhibitions of gas appliances, by letting out fittings on hire, and by introducing prepayment meters, with most excellent results, yet I know that there is a very considerable amount of fallow land in various districts, requiring cultivation and looking after to make it productive. I am one of those who have always believed that gas companies and corporations should both make the articles they supply, and guide, assist, or instruct their customers in the proper and economical use of them; and the longer I live, and the more I observe both sides of the question, the more firmly am I impressed with the wisdom of that belief.

For more than 25 years I was intimately connected with companies who, from the first, not only made gas, but also all the appliances required for lighting, cooking, and heating with it, and kept a staff of specially-trained fitters. Where this system has been carried out, the customers get their work done better and cheaper, and are instructed in the use of all the most modern appliances; consequently, the consumption is increased, and the mains are more fully utilized on account of the greater day consumption. I could give you many excellent examples in proof of this assertion; but I will only refer you to one I heard spoken of about six years ago, by Mr. Newbigging, in his presidential address, after he had collected information from various towns as to the quantity of gas that was being consumed during the night and day. He told us that at Northampton the annual consumption of gas was 215 million cubic feet, and 90 million cubic feet of this, or more than two-fifths of the whole, were used for purposes other than lighting. There were in use in the town of Northampton 250 gas-fires, 2700 cooking and boiling apparatus, 400 small stoves used by shoemakers for heating their finishing-irons, and 40 gas-engines. I at once saw the reason of this. This is the town where, in my younger days (35 years ago), I saw cooking apparatus being manufactured and sold at a very low figure.

Some of you have held gas exhibitions for the introduction of cooking, heating, and motive power; and, so far, you have done well. But I advise you not to stop there, nor rest content until you can properly get at and advise the consumers as to the most suitable and economical burners for their special requirements. I know that some of you have your hands somewhat tied in this matter, on account of what is called the trading or gas-fitting element; but why corporations or gas companies should neglect their duty towards their many thousands of customers in deference to a few of these gentlemen, I am at a loss to understand. I look upon them as very useful adjuncts indeed, when properly trained; and I know many who do their work well. But there are others who require a little teaching; and it would be an advantage to both the buyer and seller of gas if each of you had a few qualified men about you, to set a good example of work in your various towns. If you had a tolerably free hand in propagating the use of gas, I have no hesitation in saying that you would be the best possible friends to the gas-fitters in your district.

I am aware that there are gas managers who have really no opportunity of communication between the gas-works and the consumer, except when an inspector or collector calls periodically for the account; and there is no doubt that in such cases both the maker and user of gas suffer from the want of such communication. I think the time has now arrived when all companies and corporations should treat the important and valuable concern handed down to them on truly commercial lines, and on a par with other large business establishments. It is certainly their duty to protect and hand down unimpaired, and, if possible, to improve the position of the undertakings of which the directors, aldermen, and committees are the responsible trustees. It is now accepted that there are competitors in the field; and I think it is nothing but fair to all parties that the gas interest should be placed on the same commercial basis as its competitors, and that those who have the responsibility, management, and charge of gas-works, should have a freer hand than they have had in advocating the many and various advantages obtained by the proper use of gas for lighting, cooking, heating, and other purposes.

As one of the most recent examples of what can be done in this respect, I desire to refer you to a report in the JOURNAL OF GAS LIGHTING for Oct. 20 last (p. 719), from Mr. F. D. Marshall, the Chief Engineer of the Danish Gas Company, to the Directors of that Company; and also to the leading article on the subject. Here we find a Gas Company, chiefly composed of Englishmen, which has ten works in various parts of Denmark and Germany, and which has increased its consumption of gas by "leaps and bounds"—the extra consumption this year over last being for lighting gas, 6 per cent.; for cooking gas, 63 per cent.; and for motive power gas, 15·5 per cent. Taking a comparison of the consumption in 1881 and 1891, the ratios of increase are as follows: Lighting gas, 105 per cent.; cooking gas, 218 per cent.; and motive power gas, 540 per cent.

I was certainly struck with some of these figures; and when Mr. Marshall was over here about a fortnight ago, I had the opportunity of spending some time with him. I then particularly inquired of him the means employed in bringing about these extraordinary results; and I think it will not be out of place if I endeavour to give you his explanation.

In the first place, I understand that he has a very intelligent and progressive Board in London, who give him almost *carte blanche* to introduce gas lighting and heating in the various towns in which he has control of the gas-works. For this purpose, the most modern burners and best appliances, for both heating and lighting purposes, are obtained. They have various show-rooms where these goods are displayed; and lectures on burners and cookery, and other matters, are frequently brought prominently before the public. Another very important feature comes into the calculation. I believe all the Managers in the various towns are interested in furthering the supply of gas. I cannot tell you how this is worked out, but there is a kind of bonus system in operation; and this plan is found to work most successfully for all parties concerned, as the Managers are engaged and paid by results to look after both the works and the public, and to increase the consumption as much as possible. I have no doubt they work very cheerfully, seeing that they have a direct interest in the prosperity of the undertaking. In some towns, Mr. Marshall pointed out that there were whole streets where they had persuaded the users of some of the best oil and petroleum lamps to give them up, and adopt regenerative gas-lamps, which they could either buy or hire. One thing I arrived at was that there was a unanimity of feeling permeating the Directors, Engineers, and Managers, which no doubt tended largely to the great success achieved.

All this sort of thing requires perseverance, tact, and skill to bring about; but surely you must all admit that the great advantages derived are worth the trouble incurred. The towns referred to in Denmark are not very large; but there are a number of towns of similar size in England where I believe even better results might be obtained if the same policy was carried out. As to cities and large towns, several show-rooms, thoroughly equipped with all appliances for lighting, cooking, heating, and motive power, should be provided in various districts, with suitable persons to give lectures, and explain their advantages, so that the public might be thoroughly educated in the many benefits which might be derived from the use of gas.

Some of you hold the position of being connected with corporations which supply, or think of supplying, both gas and electricity. On this question I expressed my views to another Engineering Association in this building at the beginning of the year; and I feel that I cannot do better than give them to you in the same words—

> Those of us who are citizens, gas consumers, and ratepayers, are very much interested in the progress of our gas undertaking, and should urge the Council to make any electric installation totally distinct from the Gas Department, or from any other department of the Corporation, so that the ratepayers, and all others interested, may see the exact amount of profit and loss, just as they can now do by inspection of the accounts of the Gas Department. I think I shall be able to show that various interests are involved in this subject. At the present time the Gas Department is deriving profits from the consumers of gas, who, of course, are now paying their fair proportion towards the public lighting and rates of the city. The profit made by the Gas Department is passed on to the funds of the city, and the rates are consequently lower than would be the case if no profit were made. If, therefore, the electric light supersedes gas in a certain area, the profits now derived from that area may be sacrificed; and unless those using the electric light pay such a price as will secure the same profit to the electric light department as that previously received by the Gas Department, the difference will indirectly come from the gas consumers or some other source. If, however, the same profits are derived from the users of electricity, it becomes immaterial to the Corporation which illuminant they supply to the public; but if this is not carried out, I fear that the consumers of gas, who already pay a proportion of the rates of the non-consumers, will also have the additional burden imposed upon them of paying a portion of the electric light users' rates as well. The Council

* See JOURNAL for Aug. 4 last, p. 206.

have, very recently, relieved the Gas Department of the burden of the public lighting of the city, by reverting to the old plan of direct taxation; so that the non-consumers and electric light users will very properly be called upon to pay their fair share of the lighting rate in the future.

I must again take the opportunity of impressing upon the gas consumers the desirability of economically improving their present antiquated system of gas lighting, by adopting the modern regenerative or other burners, whereby they can ventilate their rooms, and get an equivalent light at from 2½ to 3½ times less cost (after allowing a very large margin for defective burners) than the Corporation would be able to supply the electric light for from a large central station, as the following calculations will show:—

Incandescent Lamp.

A 16-candle power lamp lasts 1000 hours, and absorbs 60 units of electricity, which, at 8d. per unit, cost 40s.

Ordinary Gas-Burner with Manchester Gas.

16-candle power is equivalent to 4 cubic feet of gas per hour, or 4000 cubic feet in 1000 hours, the cost of which, at 2s. 6d. per 1000 cubic feet, is 10s.

In the above calculation, I have assumed that the Corporation charge the Board of Trade limit of 8d. per unit for the electric light; and even at that figure I have grave doubts if they would be able, after paying working expenses, repairs and maintenance, and providing for a sinking fund, to hand over any profit to the Council, as is at present done by the Gas Department.

My view of the matter is that, if anyone is desirous of indulging in the somewhat fashionable and expensive electric light, by all means let him do so; but I desire not to be asked to pay any part of his bill for him. If the electric light stands on its own bottom in Manchester and other places, it will not make much headway against good and cheap gas properly consumed.

I think you will admit that, if the means suggested are employed, there would be a very considerable increase in the consumption of gas for various purposes. This would bring a larger daily consumption, and also a better utilization of your mains, which in some cases are practically dormant for many hours during the day, and your leakage would thereby be reduced. You would soon require more plant on the works to meet your increased demand, especially stoking machinery, the advantage of which cannot be too highly appreciated by both the maker and the user of gas, as it tends to cheapen the cost of production.

Like every other improvement, machinery for drawing and charging retorts was looked upon for some time as an innovation; but I am glad to say that it is now being used by those who formerly did not think that it was possible for it to supersede hand labour. It is, however, now an established fact that for years past, where it has been in full operation, the work has been done much cheaper, and the results far exceed those upon the old system of working; and I believe that it is now almost universally accepted that machinery will be generally adopted in future.

As you are aware, we make two kinds of machines to meet the requirements of large, medium, and small works. Those worked by power, with ropes, or compressed air, can be profitably applied in large towns where the machinery can be well occupied; but, inasmuch as your President desired that I should say more about the manual machine for medium and small-sized works, I will only give you a few illustrations of the saving in labour that can be effected by the power machinery. [The author then quoted the figures given in his paper read before the North British Association of Gas Managers in July last, showing the relative difference in cost between hand labour and power machinery, as exemplified at the Whitwood Chemical Works, the South Metropolitan Gas-Works, and the Aberdeen Corporation Gas-Works. These particulars will be found in the JOURNAL for Aug. 4, p. 208.]

The manual machines were the first I introduced; and I will give you a very brief description of the apparatus as it exists at the present time. I found that, in order to make the machinery work successfully, it was necessary to have the coal of uniform size, and conveyed from the stores into the charging-scoop at a minimum cost. To accomplish this, I designed a coal-breaker, elevator, and conveyors to carry the broken coal into the retort-house. Fixed store hoppers were provided in such a position that the machines travelled under them; and by having in the charging-machine an adjustable hopper capable of carrying sufficient coal for a dozen or more charges, with a frame attached for carrying the charger, the item for coal trimming and wheeling was reduced to an exceedingly low figure. It is an advantage, in designing new retort-houses, to erect coal-stores on either side of the house; and, if possible, provision should be made for an overhead railway running through them, so that the coal can be tipped direct from the truck into the coal-breaker by opening the doors at the sides or bottom, or by lifting the waggon by the buffers at one end, and letting the coal run out at the other, as in the case of the arrangement at the Oldham Gas-Works. Mr. Baker, of Reading, designed a somewhat similar arrangement for his retort-house in connection with my machinery.

The position of the coal-stores in relation to the retort-house in works already erected is no bar whatever to the application of machinery, for the comparative saving in labour is greater in those works where the stores are separated and at a distance from the retort-house, by using a system of conveyors, as illustrated in the case of Folkestone, Belfast, Cheltenham, Sheffield, Birmingham, &c.; thus dispensing altogether with the serious item of coal wheeling. Indeed, it is in this direction that a great portion of the saving is effected—a fact which I recognized when first attempting to deal with the question of labour-saving appliances in the retort-house.

These machines have, I believe, been brought to a state as near perfection as they can be, if we may judge from the fact that they have undergone very little alteration during the past few years, and have given universal satisfaction wherever they have been installed. As is well known, they depend more upon the strength of the stoker than do the other classes of machinery; but the skill required to work them is even less than with the power machines, as there are only a few simple movements to be made, and less mechanism to look after. The charger I use with these machines deposits the most perfect layer of coals in the retort that it is possible to imagine, and renders bad charging by unskilled men quite out of the range of possibility. Indeed, an expert man is far more likely to charge badly than a novice; because he learns tricks to save time by not letting the charger run its full course, or by turning the scoops over before the proper time. The saving in cost of labour by these manual machines is such as to justify me in urging their universal adoption in all gas-works where there are not sufficient retorts to employ economically the more costly power machines.

There are one or two points of vital importance in the designing of retort-houses for machinery. In the first place, let me impress upon you the necessity for having mouthpieces of the same section throughout as your retort; in fact, an increase of the section all round by ⅛-inch would be a great advantage, for, if the mouthpieces are at all contracted, the coke very often jams hard in them, and throws a great strain upon the men and mouthpieces. Again, the varieties in the section of the retorts at different works, and very often at the same works and in the same house, are a great drawback to working machines economically. All the retorts in a house should be of like section; and every retort in a tier should be at the same height from the floor. When these details are carried out, the best results are obtained; and by adopting, when making renewals, a section of retort to which either manual or power machinery could be equally well applied, the introduction of machinery in the future would not be accompanied by any additional expense beyond that incurred in the purchase of it.

From large experience in the working of all kinds of settings, I am fully convinced that the best sizes of retorts for small and medium-sized works are those recommended by me when my manual machines were first introduced—viz., 21 in. by 15 in., 21 in. by 15½ in., 22 in. by 15 in., and 22 in. by 16 in. ⌂ shape. These sizes will be equally suitable for working either with or without machinery. In larger works, where power machines can be economically employed, a somewhat larger variation can be allowed for. Any section of retort can be charged by the power machines, but the sizes most suitable are: 21 in. by 15 in. oval; and 20 in. by 15 in., 21 in. by 15 in., 22 in. by 15 in., and 22 in. by 16 in. ⌂ shape.

The retort mouthpiece lids require special attention, as they must be arranged to close back to allow the machines to pass. The distance from the face of the retort-stack to the machines is 2 ft. 6 in.; and the lids and fittings will be required to fully clear this, both when they are open and when closed. Again, the hinges should be made so that the lids are closed in the same direction as the travel of the machines when at work.

Some of the difficulties we have to contend with are the unsuitability of certain of the old-fashioned retort-houses, for want of space between the retorts and the wall or columns for supporting the roof; but most modern retort-houses have, for some time past, been arranged with the ultimate idea of adopting machinery. I regret, however, to say that, in the case of two recent examples of new houses, we had to report that machinery could not be applied, on account of the exceptionally narrow space between the retort-stack and the columns. I need hardly remark that these structures were not designed by intelligent and practical gas engineers. I recently obtained working results, giving the cost of labour and wear and tear, from a number of engineers at works where my manual power machinery has been in operation for some years; and I have just received a report of the cost of working from Mr. S. Glover, Engineer and Manager of the St. Helens Gas-Works, Lancashire. [The report referred to showed that the annual make of gas at St. Helens is 200 million cubic feet. Manual machinery was erected there in 1887, with the result that the wages for stoking, &c., were brought down from 2s. 8d. to 1s. 8·89d. per ton of coal carbonized. The author also reproduced the returns from Maidstone, Tunbridge Wells, Ramsgate, Westgate, and Folkestone, included in his paper read before the North British Association, already referred to; as well as the table furnishing particulars in regard to the working of manual machinery at Portsea, Cheltenham, Richmond, and Reading, contained in his paper read before The Gas Institute at Ryde last year, and given in the JOURNAL for July 1, 1890, p. 18.]

In some cases where the hand and machine systems are in joint operation, I cannot get complete returns, because of the difficulty of separating the gas produced under the two systems, and the trouble of keeping separate records of weights of coal. But in these cases they inform me that they will be pleased to speak most highly of the machinery, and will be glad to give any information in their power. I think, however, that the many facts laid before you from a large number of engineers, with whom most of you are personally acquainted, testifying to the excellent results obtained by the adoption of the system, prove conclusively that the time has arrived when, if you wish to be in the first rank of progress, it will be necessary for you

to adopt these labour-saving appliances. In making a comparison, I have always endeavoured to include the various items of cost, from the taking of the coal from the stores to the tipping and quenching of the coke in the yard; and if the number of retorts in any house, the number of men employed, and the rate of wages are given, we can generally estimate very nearly what it will cost by machinery, and show the saving that would be gained by its adoption in any district throughout the United Kingdom. Time will not permit of my saying more, or I could point out many examples where the application of coal breaking, elevating, and conveying machinery can be utilized in gas-works, with very considerable advantage and saving.

I have no intention of entering upon a lengthy newspaper controversy, and am therefore reluctant to set right a few misconceptions which appeared recently in an article in the JOURNAL OF GAS LIGHTING; but as the contents of the newspapers are frequently the unspoken thoughts of many minds, I venture, at the risk of calling down upon my head the censure of the leader writer, to show how far he is from duly appreciating all the established facts of engineering science. The remark to which I would call attention is the one where it is maintained that, "weight for weight, the human worker is a far more efficient agent for performing the operation of coal carbonization than the machine which is offered in his stead." Of course, this is a fact; and the statement might be extended to many other industries and with other animals as well as the human one. But, for all that, the machine makes up for its want of weight-efficiency by its possession of a constitution which can bear almost any amount of labour without fatigue; and it is consequently a much cheaper thing, as a tool, than any animal. It is well known that two horses, weighing about a ton, will draw a tramcar as well as an engine weighing 8 tons; but the horses can only work 4 hours out of a day, as against the 15 or even 24 hours of the engine. Take the case of the locomotive as another instance. Who would propose to use horses to take trains from Manchester to London because, "weight for weight," the horse is a more efficient agent than the locomotive? Could any number of horses take an ordinary express from Manchester to London in 4¼ hours? The human stoker fails to equal the machine just at the same point where the horse fails against the locomotive. Neither can we do the same amount of *work* in the same *time*, nor so much of it. It seems also that the JOURNAL OF GAS LIGHTING has yet to learn where any gas-works exist which depend wholly upon machinery. The Rochdale Road works in this city, where they make about 8 million cubic feet of gas per day, are an example, as are also Ramsgate, Folkestone, Tunbridge Wells, and many other towns; and it is a fact that better results are shown in many of these places than are ever produced by hand work continuously. As regards the remark that it is greatly to be wished that this subject could be "treated from time to time with a little more freshness," I can only say again that this was my idea when your President asked me to write this paper, as I was aware that even the language of universal approval which stoking machinery gets from all sides, might grow stale after frequent repetition.

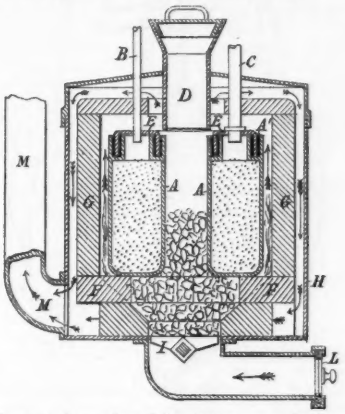
Institution of Civil Engineers.—At the ordinary meeting of this Institution held last Tuesday, a large number of elections were made—148 in all. Among the members elected was Mr. E. Bailey Denton, B.A., of Westminster. The list of new associate members included the following names: Mr. Robert Adams, Water-Works, Strathblane, Glasgow; Mr. Robert Gilmore, Water Office, Greenock; Mr. Thomas A. Guyatt, Assistant Engineer of the Monte Video Gas-Works; Mr. Harry Herbert Jones, Assistant Engineer of the Bombay Gas-Works; and Mr. Arthur M. Paddon, of the Beckton Gas-Works.

The Electric Light and Eyesight.—A discussion has been going on in the columns of the *Morning Post* as to the effect of naked incandescent electric lights on the eyesight. It appears that at some of the best London clubs, where the glow lamps employed in the writing-rooms are practically unshaded, complaints are heard among the elderly members as to their injurious effect on old eyes. In a letter which appeared last Friday, the writer stated that, when the electric light was first introduced into the Navy, especially for torpedo practice, several cases occurred among naval officers of prolonged inflammation of the retina, which could be traced clearly to the influence of the new illuminant; and he contended that no artificial light should be used for any length of time without a shade. Referring to this subject, the *Electrical Review* thinks it may be reasonably admitted that allowing the unshaded filament of one incandescent lamp to shine directly upon the eyes must have bad results; but this would, of course, be true, though probably in a less degree, of any other kind of artificial light. A competent authority in these matters has, however, expressed the opinion that the eye suffers more injury when it is exposed directly to a 16-candle incandescent lamp than to a gas-flame of similar power. With the latter, the luminous image on the retina covers more surface than is the case with the incandescent filament, and consequently the intensity of light on the points covered is greater. Our contemporary thinks that the main question raised by the *Morning Post* writers resolves itself into one of employing lamps which are properly shaded; and these ought not, it is thought, to have any influence on fairly healthy eyesight.

REGISTER OF PATENTS.

Gas Generating Apparatus.—Williams, H., of Manchester. No. 18,872; Nov. 21, 1890. [8d.]

This invention relates to apparatus for generating gas by the decomposition of petroleum or other oils, and particularly "to apparatus designed for the use of the consumers or users of gas."



The vertical retort A employed for this purpose is formed with outer and inner walls, between which is a space (of an annular or hollow cylindrical form) charged with iron scraps or fragments of iron. A channel is made at the top of the outer wall, and a corresponding channel at the top of the inner wall. The retort is provided with an annular lid or cover E, formed with two projecting flanges, which enter the above-named channels. The channels are filled to a suitable depth with common soft solder, or with lead, or with a suitable alloy, which will be fluid at the working temperature of the retort. The two pipes B and C (for the oil supply and gas outlet respectively) are screwed into the lid. The retort rests upon four fire bricks or blocks F, or upon supports arranged so that there shall be spaces for the passage of burning gases and heated products from the central fire below the retort. Surrounding the retort is a wall G; and enclosing the whole is a metal casing H—an annular space being left between the wall and the outer casing. The casing is provided with a cover, which carries the hopper D. This cover is formed at the connecting joint with a socket to fit the top of the casing, and is adapted to be readily lifted off. A ring-shaped disc of fire-clay rests upon the wall G, and can be lifted out when the cover has been removed. The central hole in the cover is larger than the outside of the hopper, so that there is a space for the passage of the hot gases. The fuel rests upon a fire-grate I, and upon the furnace bottom of fire-clay bricks or lumps. In the example, the fire-bars are mounted upon a shaft, which is extended to the outside of the casing, and is provided with a hand-lever, in order that the grate may be rocked to clear the spaces. Air to support combustion is admitted through a hit-and-miss valve L, or through any other regulating-valve.

The fire is fed with fuel through the hopper D (provided with a lid or stopper) that extends downward to, or nearly to, the mouth of the central space in the retort, so that it forms a continuation of that space. The whole of the space, including that within the hopper below the cover, may be filled with fuel, so that the furnace can be worked on the slow-combustion system, and therefore left without attention for comparatively long intervals of time. The flames and heated gases from the fire pass—as indicated by the arrows—upward through the annular space between the retort and the wall G, over the lid E, and through the opening in the cover; and then downward through the space between the wall G and the casing H to the chimney. The retort and its charge of iron fragments thus become heated to a temperature sufficient to convert into a permanent gas the oil which drips from the pipe B into the retort; and it is decomposed and rendered stable by contact with the hot iron fragments. When the generation of gas is not required, the supply of air is checked, so as to maintain the fire with a smaller consumption of fuel until the generation of gas is again required; and in cases where more than one retort is used, the gas may be led from one to the other to complete decomposition.

Gas-Governors.—Simon, R., of Nottingham. No. 19,951; Dec. 6, 1890. [6d.]

This invention, which has for its object the governing or regulating of the flow of gas from the supply to the point of combustion, is specially applicable for use with bags of gas-engines, also with heating and other stoves and lighting apparatus.

Fig. 1 [next page] is a section of apparatus for use with gas-engines. A is a metal box (having an inlet B, and an outlet C) furnished with a slack vibrating membrane D, preferably of leather, in which the spindle E of the valve F is fixed gas-tight. On the upper part of the spindle is the adjustable guide G, in a groove on which run the ends of one or more long levers H, the other ends of which are in contact with the sides of a rubber gas-bag or holder K. The gas, entering K through B and C at pressure, dilates the bag, whereupon the expanding sides press the long arms of the levers H outwards, thereby closing (more or less completely according to the position of the guide G, which may be regulated at will) the valve F, and cutting off or diminishing the further supply of gas until the pressure has fallen to the degree desired. The engine thus takes its feed from the gas stored in the bag K without affecting the pressure in the pipes; and, conversely, the pressure in the pipes cannot fill the bag K with gas at the same pressure.

Fig. 2 is a vertical transverse section of a gas regulator or governor, with two leather or other flexible diaphragms, and having the same action as the governor already described; the gas-bag being dispensed with. Fig. 3 is an end elevation of fig. 2. In this apparatus, the

Fig. 1.

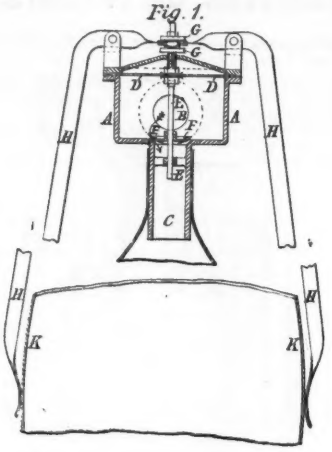


Fig. 2.

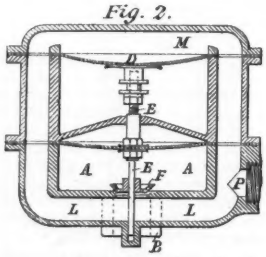
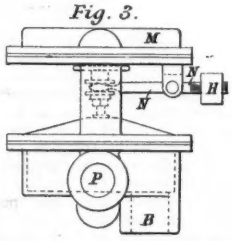


Fig. 3.



inflowing gas from B has free play in the lower chamber A, and passes through the valve F in the part L, and also into the chamber M, where it acts on the diaphragm D and depresses it; causing the valve to close by pressing on the spindle E. By adjusting the weight H on the threaded rod N, the degree of opening of the valve, and the quantity of gas passing from A through the outlet P, can be regulated, and all fluctuations of pressure in the main compensated for.

Gas-Regulators.—Cormell, J., of Cheltenham. No. 20,265; Dec. 12, 1890. [6d.]

The feature of novelty in this invention is the combined form of valve-seating employed in this gas consumers' regulator, with a special bridge or arch and guide to support the spindle—all formed of one piece of metal.

Incandescence Gas-Lamps.—Clamond, C., of Paris. No. 60; Jan. 1, 1891. [8d.]

This invention relates to lamps in which the flame of a mixture of combustible gas and air is made to heat to incandescence a refractory body; and it has for its object "a combination of devices in such lamps which will ensure a perfect combustion of the gas, a very intense luminous effect, the discharge of the products of combustion, and the absence of heat transmitted to the place of installation by the lamp."

Fig. 1.

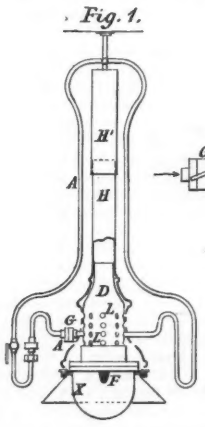


Fig. 2.

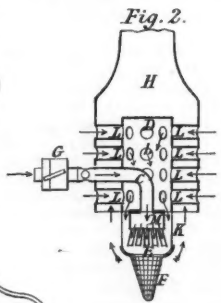


Fig. 3.

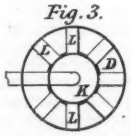
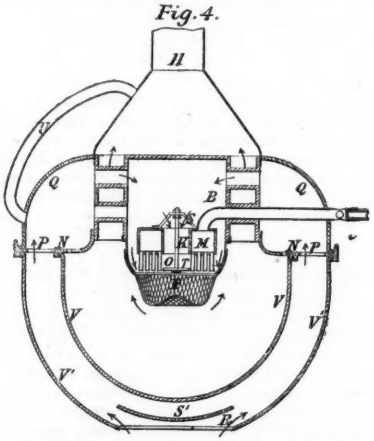


Fig. 1 is an elevation (partly in section), to a small scale, of a complete lamp of moderate power. Figs. 2 and 3 show, to a larger scale, a vertical section and a sectional plan of the burner proper, including the regenerative casing, and the magnesia hood.

The gas supplied by the pipe A passes into a box G (hereafter described), which contains the arrangement for regulating the supply. It mixes with air drawn into the pipe C through openings; and the mixture thus produced passes to the burner M, which consists of a metal chamber, having at its underside a group of small tubes extending downwards. The gas issues at the lower ends of these tubes, and there meets the hot air passing down from the regenerative casing D. Under the influence of the draught of the chimney H, the flame passes downwards through the magnesia hood F, which is thereby heated to incandescence and becomes luminous. The products of combustion, after passing through the hood, which is enclosed in the glass globe X, curve upwards, and rise towards the chimney round the box D and among the tubes L, which are thus highly heated. The regenerator D communicates with the outer air by a number of tubes L; and the air flowing through these becomes heated before passing to the burner. The air and gas entering the chamber M by the pipe C become effectually mixed in M; and then pass through the small tubes before mentioned, on issuing from which the combustible mixture meets the heated air supply from above, and enters into effective combustion therewith. In order to raise the air supply to a very high temperature before entering into combustion, the burner is surrounded with a downward extension K of the regenerator—this becoming what the patentee terms a "chamber of concentration." This chamber, being closely surrounded by the hot combustion gases rising from the magnesia hood, becomes highly heated; and thus adds to the heating of the air coming from the regenerator. In addition also, the heat of the chamber K is radiated to the chamber M of the burner, which in its turn imparts this heat to the mixture of air and gas passing through it; so that the mixture arrives at the place of combustion heated to a considerable degree.

It has been stated that, before being mixed with the air entering through the orifices shown, the gas passes through a box G. This box has a nozzle, the end of which has a number of small holes through which the gas can issue into the tube C. In the nozzle is a disc with openings for the passage past it of the gas, and with a number of tapering pins corresponding with the holes into which they project. The disc is attached to a toothed rack, which gears with a pinion, the spindle of which passes through the side of the box, and can be turned by a key or handle. The object of the regulating arrangement in G will be readily understood; for if the orifices through which the gas passes were always of uniform area, and the supply of gas were varied by means of an ordinary cock on the supply-pipe, any variations in the supply would cause variation of speed in the issuing currents, and consequent variations in the proportions of the mixture of air and gas in the pipe C. But, by restricting more or less the orifices by means of the tapering pins projecting more or less into them, the quantity of the gas supply is varied without changing the speed of the currents, and consequently the mixture of air and gas is maintained constant or nearly so. If the size of the burner M, chamber K, and regenerative casing were increased, as also the number of the holes and tubes, so as to obtain a lamp of great illuminating power, the following inconvenience would arise: The action of the chamber K would not be sufficiently great to cause the heated air supply to penetrate to the tubes situated at the centre of the group; so that the combustion of the gas issuing from them would be incomplete, as a portion of the gas would pass unconsumed through the hood, which, being insufficiently heated, would give out an imperfect light.

Fig. 4.



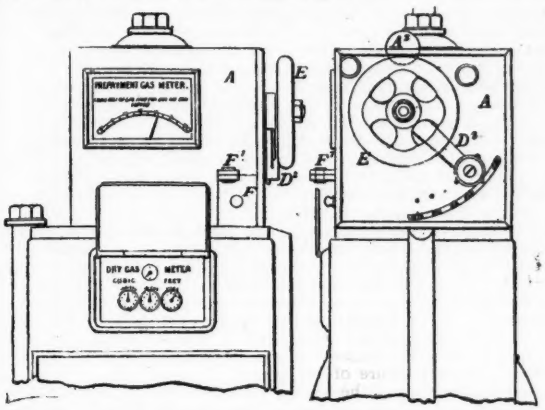
In order to avoid this inconvenience in a large lamp, the box M is made of annular shape, as shown in fig. 4; and a disc T is suspended below the central opening O, by means of a stem K fixed to a cross-head S. The hot-air supply passes both outside the tubes and also through the passage O; so that, while one portion of the air penetrates inwards through the outer row of tubes, another portion, entering by O and deflected by the disc I, penetrates in an outward direction through the inner tubes. The whole of the tubes thus obtain sufficient air supply to produce efficient combustion and uniform heating of the hood F. In order to avoid inconvenient radiation of heat from the glass globe V of this lamp, it is surrounded with a second glass globe V^1, having an opening at the bottom, and of such size as to leave a certain space between the two. The plate N, to which the two globes are attached, has large openings P through it to the space between the globes; and it is covered by a hood Q, which surrounds the regenerative casing. Under the influence of the draught of the chimney H, the outer air is made to enter between the two globes at R; and rising and taking up heat in the space between them, it arrives in a more or less heated condition in the hood Q, whence it passes into the regenerative casing on its way to the burner, as indicated by the arrows. In order to distribute the entering air all round the space between the globes, a glass baffle-plate S^1 is fixed over the opening R. A series of small openings formed in the plate N just within the inner globe V, allow of the entrance of a slight quantity of comparatively cold air, which, in passing along the inner surface of the globe, has a cooling effect. As the air from between the globes arrives in the regenerator already heated to a certain degree, the temperature at which it reaches the burner is increased to a corresponding extent, so that a higher degree of incandescence of the magnesia hood is obtained; and this largely compensates for the decrease of light due to the doubling of the globe. To enable a larger quantity of air to pass through between the globes, so as still further to cool them, the

hood Q may be connected directly to the chimney H by passages U, so that a portion of the air entering at R can escape directly to the chimney without passing through the burner.

The combustion gases are discharged by pipes, which extend to the outside of the building or open into chimney-flues. The discharge-pipes themselves constitute draught chimneys; and, by raising them to a considerable height, their sectional area can be proportionately reduced—the vertical chimney rising from the lamp needing to be scarcely larger than the pendant tube of a gaselier.

Prepayment Gas-Meter.—Sawer, J. F., and Purves, J. L. and J. H. of Manchester. No. 2626; Feb. 13, 1891. [1s. 1d.]

This invention relates to apparatus for effecting the delivery of gas or other commodity after the value thereof has been prepaid; consisting, generally, of a coin-receiving disc, and enclosed eccentric, a hinged lever, and a connecting rod or communicator.



When applying the arrangement to an ordinary dry gas-meter (as in the illustration), there is provided within the case A a disc with a cylindrical flange attached to a spindle C, passing through and borne by the frame. Upon the spindle an eccentric is mounted, enclosed within the coin disc, and provided with a boss, extending through the frame and surrounding the spindle. To the outer end of the boss, an arm D^2 is attached, by means of which the position of the centre of the eccentric in a circle described through it from the centre of the shaft can be regulated as desired. To enable the position of the eccentric when once established to be maintained, means (such as a screw D^3) are provided, by which the arm is locked; and the head of the screw D^3 is sunk into the arm, so as to permit of a seal being inserted. An indicator (shown) is provided, by which the position of the eccentric can be readily fixed, to enable the mechanism to be so operated as to deliver a certain definite quantity of gas. The end of the spindle, which is without the case A, may have attached to it a hand-wheel E, by means of which the coin-disc can be rotated. In the flange of the coin-disc, a slit is made wide enough to receive the coin A^2 freely, and maintain it in position when it is introduced through a slot formed in the case. This slit penetrates the flange, and would allow the coin to fall freely through it if the coin-disc did not enclose the eccentric. When the coin is introduced it drops through the slot into the slit when the latter is below the slot, and continues to fall until it rests upon the edge of the eccentric. When the coin is in this position (which it assumes when the parts are in a position to receive a coin), the edge of the coin A^2 is nearly level with, but does not protrude beyond, the periphery of the flange. When the handle or wheel E is turned so as to rotate the coin-disc, the coin is carried round with the disc, and is, by reason of the position of the eccentric, gradually pushed out beyond the flange until, when the disc has made half a revolution, the coin falls out of the slit into a drawer F provided for its reception. After the fall of the coin, the revolution of the disc brings the slit again under the slot, so as to permit of the introduction of another coin. In order to prevent the insertion of a coin and its removal after it has performed its work, but prior to its discharge into the drawer, by the introduction of a wire or other similar device, and in order also to prevent the mechanism actuated by the coin being operated by any other means, the bottom end of the slot is brought close to the periphery of the disc; so that, while allowing the disc to rotate freely, no instrument can be passed within the case or frame. There is also formed on the coin-disc a toothed or ratchet surface with which a detent pawl (kept in position by gravity or by a spring) engages, and which, while permitting the forward movement of the disc, entirely prevents its being turned back. This ensures the discharge of the coin A^2 into the drawer F in the manner described. The coin-disc B is geared with a pinion G fixed on the end of a short spindle G^1, borne by the frame A, and having a handle G^2 fixed on the other end, by which it can be rotated from without. The pawl B^3 is applied in this modification in a similar manner to that previously described.

A lever in a position adjoining the coin-disc, and hinged so that it has freedom of oscillatory movement, is mounted on a pin or stud attached to the casing. The lever is in such a position that, as the coin is carried round with the coin-disc, and is protruded beyond its periphery, it causes the lever to oscillate upon its centre—the extent of the oscillation being proportionate to the extent of the protrusion of the coin beyond the periphery of the coin-disc. To the oscillating lever is jointed a second lever rack, or rod (the "communicator"), by means of which the motion of the oscillating lever is transmitted to the sale and delivery mechanism.

The mechanism just described constitutes the prepayment portion of the invention, and also gives motion to the sale and delivery portion of the machine. In order to deliver gas, the frame or casing containing the mechanism is attached to a meter in some convenient position; and there is a tube by which the gas can be passed from the meter, the inlet or outlet of which can be closed by a valve actuated in a manner hereafter described. Upon the communicator there is a toothed rack, with which a spur pinion engages, so that the traverse of the communicator in either direction rotates the pinion. The pinion is fixed upon the boss of a crank mounted on the end of a screwed spindle; the crank being rotated or oscillated in either direction according to the direction of the traverse of the communicator. On a pin fixed in the crank, a pawl is mounted loosely; and this is pressed, by means of a spring, into gear with the teeth of a ratchet-wheel fast upon a spindle suitably borne by a light frame attached to and enclosed within the casing. The spindle is screwed or threaded for a part of its length; and it has upon it a spur-wheel, the eye of which is threaded to correspond. The spur-wheel is carried in a light frame or carriage loosely mounted on a rod or rods parallel with the screwed spindle, so that the rotation of the screwed spindle or wheel gives a longitudinal traverse to the carriage. The teeth of the spur-wheel engage with the teeth of a pinion, which is also formed on, or borne by, a spindle revolving in bearings in the frame, and which has its axis parallel to that of the screwed spindle. A worm-wheel is fixed on the spindle of the pinion, with which a worm on an arbor suitably placed and carried engages. The worm is rotated by any convenient means from the meter; and the rotation of the working parts of the meter while gas is being delivered is thus communicated to the different parts. Suitable mechanism is provided by which the completion of the revolution of the coin-disc so as to bring it into position to receive another coin, restores the communicator and oscillating lever to their normal position.

When the screwed spindle is rotated by reason of the oscillation of the hinged lever actuated by the coin, the carriage is moved a proportionate distance longitudinally along the rods on which it is mounted. A pin is fastened in the carriage, and takes into a slot in a hinged lever or bar. The slot in the lever is straight for the greater part of its length; but at one end it has a shorter part at an angle to the straight portion. This end of the bar is connected in any convenient manner to the gas-valve previously mentioned, which rests upon a seating formed in a tube coupled to the meter and enclosed within a chamber. The pin in the carriage moves always in the same plane; and, according to the direction of its traverse, it opens or closes the valve. So long as the pin remains in the straight part of the slot, no motion is communicated to the valve; and it is only when it enters the angular portion, that the valve is operated. When the valve is opened, the meter begins to deliver gas; and the rotation of the working parts through the gearing already described commences to bring the carriage back to its initial position. When the carriage reaches its initial point, the valve is closed, and the supply of gas is stopped.

The slot in the bar is formed of such a length that it allows of a predetermined maximum volume of gas being paid for. There is also provided in connection with the invention a locking apparatus by which, after the predetermined maximum volume of gas has been paid for, the coin-disc can be locked, so that no more coins can be received until the value of one of the coins prepaid has been consumed.

APPLICATIONS FOR LETTERS PATENT.

20,123.—INMAN, T., "An improved augur, manufactured of crucible cast steel, for use in gas or chemical works." Nov. 19.

20,185.—FIELDING, J., "Improvements in the starting and working of gas-engines." Nov. 20.

20,207.—GRUBB, H., and GEOGHEGAN, S., "Improvements in motors impelled by water and other liquids, and by gases and other fluids under pressure and in pumps." Nov. 20.

20,262.—ROBINSON, H., "Improvements in gas or combustible vapour engines." Nov. 21.

20,403.—PRIESTLEY, G. V., "Improvements in gas-motors." Nov. 24.

20,405.—BARRETT, S. R., "Improvements in gas-stoves for turning gas off and on." Nov. 24.

20,420.—LAKE, H. H., "Improvements relating to the manufacture of gas, and to apparatus therefor." A communication from W. H. Harris. Nov. 24.

20,450.—KITTEL, T. B., "Improvements in gas cooking and heating apparatus." A communication from A. Beuthner. Nov. 24.

20,511.—DONNITHORNE, E. G. M., "Improvements in gas-engines." Nov. 25.

20,524.—HORN, W. W., "An improved combined fitting for gas and electric lights." A communication from O. Strom. Nov. 25.

20,573.—HARGREAVES, J., "Improvements in feeding fuel to gas-producers, and in the generation of combustible gas." Nov. 26.

20,696.—GIBBONS, J., "Improvements in burners." Nov. 27.

20,721.—BEVIS, A. W., "Starting gear for gas-engines." Nov. 28.

20,745.—ROBINSON, H., "Improvements in gas or combustible vapour engines." Nov. 28.

20,780.—JABS, A., "Improved method of manufacturing producer and water gas." Nov. 28.

Gas-Works Extensions at Rotherham.—The Gas Committee of the Rotherham Corporation have recommended that a Sub-Committee be appointed to confer with Mr. T. Newbigging with reference to the extension of the gas-works and the adoption of the electric light.

Electric Lighting for Dublin.—The Electric Lighting Committee of the Dublin Corporation have forwarded a report to the Lord Mayor, in which they state that the contract for the installation was signed on Sept. 12 for £29,714. The contract was entered into with the Electrical Engineering Company of Ireland; the Committee approving of Messrs. Hammond and Co. as sub-contractors. Bonds were entered into for the satisfactory completion of the contract by the sureties for £10,000—Messrs. Hammond and Co. for £7000, and Messrs. John Haslam, Robert Strahan, and Arthur Nicholson for £3000. The works for the central station are progressing very satisfactorily; and unless some unforeseen circumstances should arise, the Committee hope to be in a position to start the installation in March or April next. They also suggest that, as the station will obviously for some time generate more electricity than there will be a demand for, the Corporation should set an example to the citizens, and have all the buildings under their control lighted by electricity.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Board of Trade Memorandum as to Photometers.

SIR,—I understand that some authorities in the gas world have the idea that the above-mentioned Memorandum is justified by the Sale of Gas Act, 1859 (22 & 23 Vict., cap. 66). If this Act is what the Board of Trade rely upon, their discovery is rather late in the day, seeing that the Act was passed 32 years ago, though the delay would not, of course, alter its application. Neither would its application be affected by the fact that the Board have declined to allow their inspectors to continue to stamp meters used in conjunction with the photometers at the ordinary official stations for testing consumers' gas-meters, on the ground that they were not for the purposes of trade; though these points would place the Board—to put it as mildly as possible—in rather an unenviable position. It is only fair to the Board to state that in their Memorandum they not only do not base their claim on this Act, but do not even refer to it.

For the benefit of those who have this idea, let us glance down the Act. It is styled "An Act for Regulating *Measures* used in *Sales* of Gas." The preamble states: "Whereas it is expedient that the *measurement* used in *sales* of gas for lighting, heating, and other purposes should be hereafter regulated by one uniform standard, and that all meters should be stamped as hereinafter provided;" and section 1 (the interpretation clause) states: "In construing this Act, the word 'meter' shall mean *gas*-meter, and shall include every kind of machine used for *measuring* gas." Section 2 fixes as the "legal standard or unit of measure for the sale of gas by meter," "the cubic foot, containing 62·321 pounds avoirdupois weight of distilled or rain water," &c., which could not apply to a photometer; and section 3 requires "models of gasholders measuring the said cubic foot," &c., to be made and verified "within three months next after the passing of the Act." The Act then goes on to deal with the appointment of inspectors; the providing of copies of the models; the appointment of inspectors by town councils, &c., for boroughs; and the attendances of inspectors at the towns where the gas is consumed. Under section 11, which imposes a penalty for refusal to stamp any meter, the Board may, by the above-mentioned refusal, have rendered themselves liable, *if* their present contention were correct. By section 12, meters are not to be stamped if more than 2 per cent. incorrect in favour of the seller, or 3 per cent. in favour of the consumer; and it would be interesting to know how this is applied to a photometer. Then the Act goes on to lay down (sec. 13) rules for testing meters—firstly, for soundness or leakage, &c.; to authorize (sec. 16) every consumer of gas to purchase and use, for the *measurement* of gas supplied to him, any meter, &c.; and to require (sec. 17), "after the expiration of ten years from the passing of the Act," all meters "used for *buying* and *selling* gas, or for the *collecting* of any rates or duties, or for making any charges on the *passage*, *transmission*, or *conveyance* of gas," to be stamped. But I need not pursue this further, since a perusal of the Act clearly shows that it was never intended to apply, and that much of its language is totally inapplicable, to photometers. In my former letters [*ante*, pp. 851, 901], I have already dealt with this Act, so far as the Weights and Measures Acts, 1878 & 1889, are expressly made to apply to it.

Mr. W. Sugg, in a long letter in your last issue, amuses himself with my *nom de plume*. I should have thought that Mr. Sugg was sufficiently a man of the world to have known that a barrister would not have taken the trouble to write so long an opinion for nothing, but that, as a director, he did not wish gas companies to be rushed or frightened into an expense they were not bound to incur. Without wishing in the least to deprive him of any pleasure this announcement may have afforded him, I cannot help saying that his letter would have been of more service to the determination of the question if he had stated what was his object in writing, if other object he had. He commences: "I understand him to say that a photometer used for verifying the illuminating power of gas supplied to any city or town cannot be legally stamped." So *he* may understand; but *I* did not say so. If the Board should take to stamping engineers, there would be nothing illegal in it (provided, of course, that the victims consented); but if it tried to compel all engineers to undergo the tattooing *nolens volens*, such action would be illegal. Surely the distinction is apparent. He goes on to tell us: "The Superintendent of the Standards informed me that the Board of Trade declined to say whether the stamping of the photometers was compulsory or not." This is hardly the view that the Memorandum seems intended to convey, though to some extent it does; and this statement does still further suggest that the Board have not much confidence in their interpretation of the Acts. "Now, therefore," he concludes, "I submit that it is clear, from what I have stated, that nothing but good can be the outcome of the stamping of statutory photometers by the Standards Department of the Board of Trade." Nothing but good to Mr. Sugg and his brethren, perhaps; but nothing but useless expense to gas companies. "And," he continues, "it would hardly be likely that gas companies would object to the local authorities getting the statutory photometers stamped." Certainly not, nor even to the authorities getting them new photometers, or even paying for the company's general renewals. On one point, at least, Mr. Sugg and I seem at one—namely, that the local authorities, who (if anybody) are to benefit by the stamping, should "pay the piper."

In conclusion, let me remind Mr. Sugg that if a photometer does fall within the Act, then he has incurred many a penalty of £5 for selling them unstamped.

A BARRISTER-AT-LAW AND GAS DIRECTOR.

Lincoln's Inn, Dec. 2, 1891.

The Extensions at the Stockport Gas-Works.—At the monthly meeting of the Stockport Town Council last Wednesday, the Vice-Chairman of the Gas Committee (Mr. J. Noden) reported that extensions had just been completed at the Portwood works which increased the make of gas by 2¾ million cubic feet per week; and other extensions were contemplated which would give a further increase of 4½ million cubic feet per week. The enlargement already effected would prevent a recurrence of the difficulties experienced last winter.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1892) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

Abergele, Rhyl, and St. Asaph Joint Water.—The Abergele and Pensarn Local Board intend applying to Parliament for power to form a Joint Board for the above-named places with Rhyl and St. Asaph, for the purpose of acquiring the works of the Rhyl District Water Company, and taking over the water supply of the united district. In the Bill to be promoted with these objects, the price to be paid for the undertaking will be specified, and provision will be made for the dissolution and winding-up of the Company, whose rights and privileges will be assumed by the Joint Board. Power will be asked to enable the Board to dispose of any portion of the water-works to a local authority whose district may be within the area of supply, on terms to be agreed upon; or to sever their connection with the two other bodies associated with them in the scheme under notice. Money will be required for the purposes above set forth; and permission to raise it is to be sought.

Airdrie and Coatbridge Water.—Application is to be made by the Airdrie and Coatbridge Water Company for power to construct additional works, consisting of two storeage reservoirs and a service reservoir, with connecting conduits, &c.; and to divert and appropriate certain streams. The Company's capital is to be re-arranged and increased, as is also the contingent fund; and their limits of supply are to include the parishes of Shotts, New and Old Monkland, and Shettleston, in Lanark.

Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works.—It is the intention of the Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Joint Committee to apply for an extension of the time limited by their Water Act of 1870 for the completion of the works therein specified. The Committee will also ask for additional powers with respect to the purchase, holding, sale, and disposal of lands; and the Bill to be promoted will contain provisions as to the payment of rates, the supply of water, the prevention of waste, &c.

Barrow-in-Furness Corporation Water.—The Corporation of Barrow-in-Furness are desirous of obtaining an additional supply of water from Poaka Beck and Rathmoss Beck, in Lancashire; and for this purpose they will apply for authority to construct the necessary works. These will comprise a reservoir in Dalton and another in Barrow, with the needful conduits and pipe-lines. The above-named becks and their tributary streams, as well as any other springs, streams, and waters which may be intercepted by the proposed works, are to be appropriated. Further money powers will be sought; as also permission to alter and increase the rents, rates, and charges.

Barry and Cadoxton Gas and Water.—Authority will be sought by the Barry and Codoxton Gas and Water Company to construct new works, acquire additional land, and raise further capital. The works are in connection with the water portion of the undertaking; and they comprise a well on Dinas Powis Moor, with the necessary conduits, &c.

Birmingham Corporation Water.—The Corporation of Birmingham notify their intention of applying for an Act to enable them to carry out the new scheme of water supply for the borough from Mid-Wales, which has already been fully described in our columns. The Rivers Elan and Claerwen are the sources to be drawn upon; and the works for conveying their waters to Birmingham comprise eight reservoirs, a submerged dam, pipe-lines, water-tanks, a railway, and numerous road diversions. The carrying out of the scheme will necessitate the removal of a church and a chapel, and the closing of a burial-ground. The works proposed to be authorized by the Act are to be constituted part of the present water undertaking of the Corporation; and all the enactments now in force relating thereto are to apply to the new works. The Bill to be promoted to carry out the scheme will contain the necessary provisions with regard to the borrowing of money, the increase and alteration of rents, rates, and charges, the creation of a special water fund, and other financial matters.

Blackburn Corporation.—In a Bill which the Blackburn Corporation intend to promote for consolidating various townships within the borough into one township, provision will be made for the extension of the limits of gas and water supply so as to include Billington and Whalley.

Blackpool Improvement (St. Anne's-on-the-Sea Gas).—In an Improvement Bill of which the Blackpool Corporation have given notice, provision will be made for the acquisition by the Corporation of the part of the undertaking of the St. Anne's-on-the-Sea Gas Company lying within the borough, and the granting to them of the exclusive right of supplying gas in that area. The St. Anne's-on-the-Sea Gas Order, 1876, and the Blackpool Improvement Act, 1879, will be altered and amended to allow of this arrangement being carried out. Additional borrowing powers will be sought for the general purposes of the Bill.

Bournemouth Improvement (Electric Lighting).—In a General Powers Bill to be promoted by the Bournemouth Corporation, authority will be asked to enable them to light by electricity, provided by them at their cost, their offices and premises and the piers belonging to them, as well as any public recreation-ground, including the Winter Gardens and the buildings therein.

Bradford Corporation Water.—A large scheme of extension in connection with their water-works is projected by the Bradford Corporation; and a Bill is to be promoted to enable them to carry it out. The new works consist of a storeage reservoir near Haden Carr, on the River Nidd, another at Woodale, and two service reservoirs at Chellow Heights, with various aqueducts and pipe-lines. These works are in substitution of those sanctioned by the Bradford Corporation Water Act of last year. The Corporation will ask for power to make certain alterations of their existing works, particularly in connection with the Grimwith reservoir. Authority will be sought to raise additional money, not exceeding £100,000, for the above-mentioned purposes.

Bristol Gas.—The Bristol Gas Company intend to apply for power to purchase compulsorily certain lands and property, to enable them to increase their storeage plant and construct new works. No further capital will be required.

Brynmawr and Abertillery Gas and Water.—Power will be sought by the Brynmawr and Abertillery Gas and Water Company to construct new water-works in the parish of Aberystruth, in Monmouth, and to appropriate certain waters and streams. The Company's limits are to be extended to Llanhilleth, and their powers as to both gas and water supply enlarged. The Bill to be promoted for carrying out these objects will contain provisions for the regulation and confirmation of the existing and additional capital, the dividends to be paid thereon, and the price to be charged for gas and water, which may be supplied in bulk.

Cleator Moor Local Board.—The Cleator Moor Local Board wish to be authorized to acquire the undertaking of the Cleator Moor Gas Company, Limited, and to continue, maintain, and erect gas-works, and supply gas within a district extending beyond the present limits. The usual powers granted to suppliers of gas will be sought, as well as permission to borrow money for the purposes contemplated. Provision will be made for the dissolution and winding-up of the Company.

East Grinstead Gas and Water.—The East Grinstead Gas and Water Company will seek power to erect gas-works on land adjoining the present site, and also to construct new water-works. Authority will be asked to purchase lands and casements compulsorily, and to appropriate water; also further powers as to rates, the breaking up of streets, and generally in relation to the supply of gas and water, and the management of the Company's affairs. It is proposed to amend the Company's Act of 1878 as to the supply of water by meter. Additional capital will be applied for.

Exmouth and District Water.—The Exmouth and District Water Company will apply for power to construct additional works, comprising dams across the northern and western tributaries of the Budleigh Brook, on Bicton Common, covered service-tanks, and various conduits or pipe-lines and other works in connection therewith. Authority will be sought to take and impound waters, and make provisions as to compensation to parties affected; also to raise further capital for the foregoing and other purposes.

Frimley and Farnborough District Water.—Application is to be made for an Act to exclude certain places from the limits of water supply of the Woking Water and Gas Company, and to confer upon the Aldershot Gas and Water Company and the Wokingham District Water Company, Limited, or either of these Companies, or any Company, body, or person whose works may be in communication with, or adjacent to the excluded area, the right of supply therein, as well as power to enter into agreements with the Local Authorities of the district for the sale of water in bulk or otherwise. Permission will be sought for the use by these Authorities of their rates or funds or others which they may obtain, for the purposes above mentioned; and for the employment by the supplying Companies of their present capital, or any additional money they may be authorized to raise, in carrying on the fresh business acquired. Certain existing Acts and Provisional Orders will have to be amended to allow the proposed changes to be effected.

Glasgow Water.—The Glasgow Water Commissioners wish to be authorized to make certain deviations of the aqueduct and relative works, in the counties of Perth and Stirling, sanctioned by the Glasgow Corporation Water-Works Act, 1885, and to abandon portions of the aqueduct. They will ask for an extension of the time in which to complete the Craigmaddie reservoir; and for provision to be made in regard to the supply of water under pressure for hydraulic power. Additional borrowing powers will be included in the application.

Ilkley Improvement.—The Ilkley Local Board seek authority to construct and maintain a reservoir, conduits, and other works; and also power to purchase the undertaking of the Ilkley Gas Company, extend their district, and generally carry on the business of gas supply. Additional money powers will be asked for.

Ipswich Corporation (Water).—The Ipswich Corporation intend to apply for power to purchase, compulsorily or by agreement, the undertaking of the Ipswich Water Company, and to supply water in the borough. Provision will be made for the winding-up and dissolution of the Company, and the transfer of all their rights and privileges to the Corporation.

Kilmarnock Water.—Application will be made by the Kilmarnock Corporation for power to purchase, by agreement, the undertaking of the Kilmarnock Water Company, and to maintain, continue, and extend their works. The Corporation wish to carry on the business with all the powers and privileges now held by the Company, which, on the transfer of the undertaking, will be dissolved, and its affairs wound up.

Lanarkshire (Middle Ward District) Water.—Power will be sought by the District Committee of the Middle ward of the county of Lanark to construct works and supply water. The works will consist of two storeage and five service reservoirs, with the connecting aqueducts and pipe-lines. The Committee will apply for the necessary authority for the acquisition of land, the appropriation of streams, and the levying of rates and charges in respect of the water supplied by them; also for permission to borrow money for the purposes of the undertaking.

Leeds Corporation.—In a Consolidation and Improvement Bill of which the Leeds Corporation have given notice, power will be sought to alter and enlarge their existing gas-works, and supply gas in the borough, together with the adjacent townships of Roundhay, Rothwell, and Shadwell; also to produce and sell residuals, and to manufacture, let on hire, and deal in gas-fittings and other appliances. Provisions will be inserted for the sale by the Corporation of a portion of their undertaking, for regulating the quality and price of gas, and for the creation of a reserve or depreciation fund. Authority will likewise be asked for the continuance and extension of their water-works, and the sale of water in bulk, the levying of rates and charges, the abstraction of water from the Rivers Wharfe and Washburn, the supply of fittings, and other matters, including the formation of a reserve or depreciation fund. Borrowing powers will be applied for in respect of the various matters comprised in the Bill.

Liverpool Gas.—The Liverpool United Gaslight Company notify their intention of applying for power to erect works and buildings for the storeage of gas upon a piece of land described; and also to purchase sell, and let on hire, gas meters, fittings, machinery, and appliances connected with the use of gas. The various Acts of the Company are to be altered or amended so far as may be necessary.

Llanbradach District and Aber Valley Water.—A Company formed for the supply of water in certain places in the counties of Glamorgan and Monmouth seek to be incorporated with power to construct the necessary works, purchase lands, appropriate springs and streams, and levy rates and charges. Section 5 of the Pontypridd Water-Works Act of 1864 is to be repealed, so far as it authorizes the Pontypridd Water Company to supply water within any part of the new Company's limits, which comprise fifteen parishes, townships, or hamlets in Glamorgan, and eight in Monmouth.

London County Council (General Powers).—In a General Powers Bill of which the London County Council give notice, they will seek authority to prohibit the breaking up of, or interference with any new bridge and its approaches for laying down any gas, water, or other main or pipe, or doing other work, except with their consent, and subject to such terms and conditions as to payment and otherwise, as they may determine. They will also ask to be permitted to make provision as to any loans to be granted by them to the Vestry of St. Pancras for the purpose of carrying out electric lighting works, and as to the period within which such loans are to be repaid; also as to the creation, issue, and redemption of consolidated stock raised for the purpose of such loans. In this Bill the Council will apply for the powers in respect to inquiries and negotiations relative to the London Water Supply, and the liquidation of the costs and expenses thereof, which have already been noticed in the JOURNAL.

London County Council (Subways).—The London County Council notify their intention to promote a Bill to confer upon them certain powers in regard to subways now belonging to them or hereafter to be constructed. They will require the several companies supplying gas and water, and owning or using telephonic, electric, or otherwires and appliances in the Administrative County of London, and other companies and persons having power to interfere with streets in that county, to make use of such subways for the reception of mains, pipes, and wires hereafter to be laid or placed by them, and, on terms and conditions to be prescribed, to move into these subways all mains, pipes, and wires already laid. The Bill will contain provisions as to restricting the breaking up of streets, the recovery of rent for the use of the subways, the removal of pipes, wires, &c.

London Water.—The Corporation of London and the London County Council will jointly apply for powers with respect to the water supply of London and the neighbourhood. It is proposed that a Water Committee, consisting of members nominated by the Corporation and the Council, should be appointed; and that the Council should have power to promote Bills for certain objects which have already been fully specified in the JOURNAL (*ante*, p. 957).

London Water (No. 2).—A notice, in precisely similar terms to the one above mentioned, has been given by the Corporation of London on their own behalf.

Middlesbrough Corporation.—In a General Purposes Bill of which notice has been given by the Middlesbrough Corporation, authority will be sought for the enlargement of their gas-works, and, in connection therewith, to make a new street along the western side of the extension. Additional lands, adjacent to the gas-works, will be required; and powers will be applied for to purchase these, and the buildings thereon, compulsorily or by agreement. For these and the other purposes specified in the notice, more money will be needed; and the Bill will contain the necessary provisions in this respect.

Mold Water.—The Mold Gas and Water Company wish to extend their limits of water supply and construct new works, consisting of a reservoir situated in the parishes of Cilcen, in Flint, and Llanferres, in Denbigh, and another in the township of Hendrebiffa, in the parish of Mold, with three auxiliary aqueducts or pipe-lines. Power is to be sought to carry out these works, as well as to acquire certain lands and streams; and additional capital will be required for these purposes. The Company will also ask for the repeal of section 80 of their Act of 1867, which provides that the Company are not to be entitled to compensation for any damage that may arise to any of their mains or pipes by reason of the subsidence of the ground in which they are laid, consequent upon the working of minerals thereunder; and for the amendment of section 85 of that Act, relating to the supply of water by the Company for sprinkling the public roadways of Mold.

Newcastle-upon-Tyne Improvement.—In a General Powers Bill of which notice has been given by the Corporation of Newcastle-upon-Tyne, authority will be sought to enable them to test the illuminating power of the gas supplied by the Newcastle and Gateshead Gas Company at other places than the works of the Company in the city, and to amend section 27 of the Newcastle-upon-Tyne and Gateshead Gas Act, 1879, accordingly.

Newport (Mon.) Corporation.—The Newport (Mon.) Corporation wish for a prolongation of the time specified by the Newport Water-Works Act, 1887, for the completion of certain works, and the compulsory purchase of land in connection therewith.

North Shields Water.—The North Shields Water Company desire to extend their limits of supply so as to include the borough of Tynemouth, and the several townships of Whitley, Monkseaton, and Murton. Authority is to be sought for the purchase of water in bulk from the Newcastle and Gateshead Water Company, on terms to be agreed upon or ascertained by arbitration; and also for the sale of the undertaking to that Company or any other, or to the Tynemouth Urban Sanitary Authority, subject to or freed from certain rights of the Duke of Northumberland. The Bill to be promoted for carrying out the above-mentioned objects will contain provisions for preventing waste and contamination of the Company's water, levying rates, raising additional capital, and other purposes connected with the undertaking.

Ormskirk Gas.—The Ormskirk Gas Company are desirous of extending their limits of supply so as to include the townships of Lydiate, Maghull, Melling, Scarisbrick, Halsall, and Parbold; and necessary

authority is to be sought, as also to continue their existing gas-works, and purchase land on which to erect others. Further capital will be needed. The Bill to be promoted will contain provisions as to reserve and insurance funds, the quality and pressure of gas, the sale of residuals, gas-fittings, &c., and the alteration of the present price of gas.

Oxford Gas.—The Oxford Gaslight and Coke Company desire to have their limits of supply so enlarged as to include the whole of the county borough of Oxford and the parish of Wolvercote, and to be empowered to make the standard price of gas uniform throughout the whole of the city. For the latter purpose, the 39th section of the Company's Act of 1882 is to be amended. The Bill to be promoted for the above purposes will contain the necessary provisions for making the ordinary meetings annual, and for paying interim dividends. Additional share and loan capital is to be asked for, as well as authority to consolidate or convert shares into stock, and recover any moneys owing in connection with gas apparatus or appliances supplied by the Company.

Pontypool Gas and Water.—It is the intention of the Pontypool Gas and Water Company to apply for power to construct additional water-works, consisting of a reservoir and several catchwaters and pipe-lines, and to purchase lands and take waters. An extension of time will be asked for the completion of certain works, and the abandonment of others, authorized by the Company's Act of last year.

Pontypridd Water.—The Pontypridd Water Company wish to be empowered to construct additional works, consisting of a reservoir and filter-beds in the parish of Aberdare, and various conduits in connection therewith. Authority will be sought to purchase lands and to intercept and impound streams and springs; also to raise further capital.

Rhyl District Water.—The Rhyl District Water Company intend to apply for authority to construct a new reservoir, with an aqueduct or pipe-line, and to appropriate the Dolwen stream, on which it will be formed. Further powers and provisions as to capital will be sought, as well as permission to alter and increase the rates and charges for water now authorized.

Rhyl Improvement.—The Rhyl Improvement Commissioners wish to be empowered to purchase, by compulsion or agreement, the undertaking of the Rhyl District Water Company, and to carry it on, levy rates and charges in respect of water supplied, enter into agreements with local authorities for the sale of water in bulk, or for the transfer to them of a portion of the undertaking, and to borrow money for these and other purposes.

Rhymney Valley Gas and Water.—A Bill is to be promoted to incorporate a Company for the construction of water-works to supply certain parishes and places in the Rhymney Valley with gas and water. It is proposed to purchase and transfer to the Company the works belonging to the Bargoed and Hengoed Gas and Water Companies, and to take over the supply of gas and water now in the hands of those Companies.

Southborough Local Board.—The Local Board of Southborough intend to apply to Parliament for authority to carry out the provisions contained in the Southborough Gas Order, 1891, as to the purchase by them of the undertaking of the Southborough Gaslight and Coke Company, Limited, with all the rights and privileges appertaining thereto. Power will be sought to continue and extend the existing works, erect new ones, and generally to carry on the business of gas supply. Permission will be asked for an arrangement with the Tunbridge Wells Gas Company with reference to the supply of gas in that part of the Local Board's district which is now served by the Company, or for the purchase of the Company's undertaking situated within that district. It is proposed that the present borrowing powers of the Board should be enlarged, and that authority should be conferred upon them to enter into agreements for the supply of gas beyond the limits to be defined.

Southend Gas.—The Southend Gas Company intend to apply for power to acquire additional lands, erect new works, construct a jetty or landing-stage, and manufacture and deal in stoves and other gas appliances. It is proposed to alter the provisions of the Company's existing Act relating to the charge for gas and the rate of dividend, and to adopt the principle of the sliding scale. Additional capital will be asked for.

Stamford Gas.—The Stamford and St. Martin's Stamford Baron Gaslight and Coke Company give notice of their intention to apply for the amendment or repeal, wholly or in part, of the Act by which they were incorporated (passed in the reign of George the Fourth), and the incorporation and continuance of the Company under the same or another name. It is proposed to extend the limits of supply, define and increase the capital, acquire land and construct new works, treat residual products, manufacture and deal in stoves, and levy rates and charges on the sliding-scale system.

St. Pancras Vestry (Electric Lighting).—The Vestry of St. Pancras intend to apply for an Act to authorize them to borrow money for the purposes of their Electric Lighting Order, 1883, and to provide for the time and mode of its repayment. The Act is to confer on the London County Council and the Vestry any powers which may be deemed expedient to carry it into effect; and it will incorporate the provisions of the Local Authorities Loans Act, 1875, and Part V. of the Public Health Acts Amendment Act, 1890.

Sunderland and South Shields Water.—The Sunderland and South Shields Water Company wish for power to construct additional works, consisting of a pumping-station in the parish of Houghton-le-Spring; a line of pipe starting therefrom, and terminating at Silksworth; and a communication road. No fresh capital will be applied for; but permission will be sought for the employment of the Company's existing funds, and any other money they may have power to raise, for the purposes above specified.

Sutton Coldfield Corporation Electricity and Gas.—The Corporation of Sutton Coldfield intend to promote a Bill to enable them to purchase the undertaking of the Sutton Coldfield Gaslight and Coke Company, and also a portion of the gas undertaking of the Birmingham Corporation, and to confirm any agreement or agreements entered into relative to the purchase. The necessary powers will be sought for making and supplying gas and electricity within the borough, maintaining and continuing the existing gas-works and constructing others, purchasing lands by compulsion or agreement, levying rates, borrowing money, &c. Permission will be asked to enter into arrangements with local sanitary or other authorities, either within or beyond their district, for the supply of gas and electricity; and the necessary provision will be made for the dissolution and winding up of the Company.

Swansea Corporation Water.—Application will be made by the Swansea Corporation for power to obtain a new supply of water from the River Cray, in Brecknockshire, and to construct the necessary reservoirs, aqueduct, tunnel, cuttings, and other incidental works. The storeage reservoir will be situated in the parish of Devynock, in the county of Brecknock; and the service reservoir will be in Swansea. The usual provisions for protecting the source of the supply and the prevention of pollution, for selling water in bulk, providing compensation water, raising more money, &c., will be included in the Bill.

Swinton and Pendlebury Local Board.—The Swinton and Pendlebury Local Board will apply for power to acquire the portion of the gas undertaking of the Salford Corporation which lies within the Board's area, as well as in the districts of Barton, Eccles, Winton, and Monton, and supply gas therein; also to purchase land and construct works for the manufacture and storeage of gas and residual products. The general powers granted to a gas company will be sought. Provision is to be made for the purchase, by the Local Authority of the above-named districts (the Barton Board), of the Swinton Board's gas-works within their limits, and for the transfer to that Authority of a section of the Corporation's undertaking, and some of the powers contained in the Bill to be applied for. Authority to raise the money necessary for carrying out the scheme will, of course, be included.

Tredegar Local Board Water.—The Tredegar Local Board purpose applying for authority to construct additional water-works and supply water to Sirhowy and Dukestown. The repeal of certain Orders granted by the Local Government Board in 1875 and 1880 to the Ebbw Vale Local Board for the supply of the above-named places with water will be sought, as well as permission to purchase the Board's pipes and apparatus. Further borrowing powers will be included in the application.

Uttoxeter Water.—Power is to be sought by the Uttoxeter Rural Sanitary Authority to construct new water-works, and acquire those now existing belonging to the Trustees of the Aftermath of the Meadows Charity; to supply water in Uttoxeter and the neighbourhood; and to levy rates and charges therefor. The expenses incurred in carrying out the above objects are to be defrayed out of a fund to be defined in the Bill; and moneys raised in connection with the water undertaking will be chargeable upon that fund.

Western Valleys (Mon.) Water.—The Western Valleys (Mon.) Water Company desire authority to purchase the undertaking of the Risca and Pontymister Gas Company (which will be dissolved and wound up), and supply gas and water within the limits of the two Companies. Additional capital and extended borrowing powers are to be sought; and provision will be made for settling the amount of the share and loan capital of the purchased undertaking. Section 39 of the Western Valleys (Mon.) Water Act, 1891, relating to pressure within the Company's district, is to be amended.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1892).

Under the Gas and Water Works Facilities Act, 1870.

Bideford Gas.—The Bideford Gas and Coke Company, Limited, seek to be authorized to maintain and extend their existing works, and manufacture and supply gas in the borough of Bideford and part of the parish of Northam, in North Devon; also to sell gas in bulk, supply meters, stoves, and fittings, and generally carry on their business with the usual powers granted to gas companies. For all these purposes additional capital will be needed.

Bilston and Willenhall Gas Companies' Amalgamation.—Application will be made by the above-named Companies for authority to amalgamate, and to raise additional capital for carrying on the united undertaking.

Cullingworth Gas.—The Cullingworth Gas Company, Limited, desire power to maintain and continue their existing works, and erect new ones, for the supply of gas in Bingley and Wilsden, in the West Riding of York. It is proposed to repeal the provisions of the Bingley Extension and Improvements Act, 1867, and the Clayton, Allerton, and Thornton Gas Company's Act of 1867, authorizing the Bingley Commissioners and the Company respectively to supply gas within the limits which are to be defined in the Order as the district of the undertakers. Provision will be made to enable the Cullingworth Company, the Bingley Improvement Commissioners, and the Clayton Company to enter into agreements for the supply of gas by any one of them within any part or parts of the district. The first-named Company will need additional capital for the purposes above set forth.

Glastonbury and Street Gas.—Authority will be sought by the Glastonbury Gas and Coke Company, Limited, to maintain, alter, and extend their existing works, and supply gas in the parishes of St. John, and St. Benedict, Glastonbury, and the whole of the parish of Street, in Somerset. The Company desire powers to increase their cadital, supply meters, stoves, and other appliances, and for other purposes. It is proposed to alter the scale of voting, fix the qualification of Directors, and regulate the proceedings at meetings.

Kempston Gas.—The Kempston Gas Company, Limited, purpose applying for power to continue their existing works, and to construct additional works for the supply of gas within the parishes of Kempston, Biddenham, Elstow, and Wootton, in Bedford. These places are at present in the area of the Bedford Gas Company, whose Act of 1864 is to be amended, so as to enable the two Companies to enter into agreements for the supply of gas by either of them to any parts of the district.

Mitcham and Wimbledon Gas.—The Mitcham and Wimbledon District Gaslight Company wish to be empowered to purchase additional land, and to construct and maintain thereon works for the manufacture of gas and the treatment of residual products. The Order to be applied for will amend the Company's Act of 1867, and will incorporate the Gas-Works Clauses Acts of 1847 and 1871.

Newington Water.—The Newington Water Company, Limited, intend to apply for power to construct new works, for which purpose they will ask permission to raise additional capital.

Pocklington Water.—The Pocklington Water Company, Limited, purpose applying for authority to construct additional works, and to acquire, by agreement, easements over certain land and springs, for which purposes further capital will be sought.

Poole Water.—The Poole Water-Works Company, Limited, desire to be authorized to maintain, continue, and extend, their existing works, and supply water within an area defined in the notice; also to supply meters, fittings, &c., levy rates and charges, and generally carry on their present business. Further capital will be applied for.

Prestatyn Gas.—Mr. H. D. Pochin, of Bodnant Hall, Denbigh, wishes to be empowered to construct gas-works on a piece of land near the London and North-Western Railway Company's station at Prestatyn, in Flintshire, and to manufacture and supply gas in the parishes of Meliden, Cwm Dyserth, and Newmarket, in that county; and the Order for which he will apply will contain all the usual provisions relating to gas undertakings.

Ross Water.—Application will be made by Mr. T. Blake, of Lebanon, Ross, for authority to maintain and extend the water-works at present existing in the parishes of Ross and Bridstowe, in Herefordshire. These works are fully specified in the notice; and the additional powers to be sought will have reference to extensions of mains, the provision of meters and the supply of water by measure and in bulk, the protection of the property generally, and the recovery of rates and charges.

Sevenoaks Water.—The Sevenoaks Water-Works Company will apply for power to raise additional capital, and to amend their Act of 1878.

South Normanton, Blackwell, and Hucknall-under-Huthwaite Gas.—Application is to be made by the South Normanton, Blackwell, and Hucknall-under-Huthwaite Gas Company, Limited, for power to maintain, continue, and extend the existing gas-works, which stand upon land belonging to the South Normanton and Blackwell Gas and Water Company, Limited, and to make and supply gas within the parishes of South Normanton (so far as it is not within the limits of the Riddings Gas Company), Blackwell, and Tibshelf, in Derby, and of Hucknall Huthwaite, in Nottingham; also to manufacture and sell residual products at the works and elsewhere. All the usual powers with respect to gas-meters, fittings, &c., opening streets, the supply of gas in bulk, and the levying of rates and charges, will be asked for. The amount of capital will be defined; and provision will be made for increasing it by the issue of further shares and stock, or otherwise.

Sutton and Hooton District Gas.—It is the intention of the Sutton and Hooton District Gas Company, Limited, to apply for power to maintain and continue their existing gas-works, and construct new ones, for the manufacture and supply of gas within the townships of Willaston, Hooton, Sutton, and other places in Cheshire; to acquire additional lands for the purpose; and to lay down mains, pipes, &c. The usual authority to break up streets, supply gas in bulk, and levy rates and charges will be sought.

Willenhall Gas.—The Willenhall Gas Company wish to be authorized to acquire lands, erect works, and manufacture gas and residual products, and generally carry on the business of gas supply, for which additional capital will be required.

Wokingham Water.—The Wokingham District Water Company, Limited, desire authority to supply the parish of Hurst, parts of Sonning and Remenham, Wargrave, and other places in Berkshire, with water; also to purchase additional land, sink a well, erect a pumping-station and works, and construct a reservoir. More capital will be applied for to enable them to carry out their scheme.

Under the Electric Lighting Acts, 1882 and 1888.

Applications for powers in regard to the supply of electricity for lighting and other purposes will be made by the Local Authorities in the under-mentioned places; the asterisk (*) indicating that the gas supply is in the hands of the applicants:—

Aberystwith, Ashton-under-Lyne, Dublin, Finchley, Govan, Halifax,* Hampstead, Harwich, Kilkenny, Lambeth, Limerick, Maidstone, Newbury, Sheffield, Shoreditch, Sutton (Surrey), Waterford, West Ham, and Whitechapel.

Electric Lighting Orders for the following places will be applied for by the parties named:—

Brighton—Brighton and Hove Electric Light Company, Limited.
Fareham—Fareham Electric Light Company, Limited.
Hackney—East London Electric Supply Company, Limited.
Horswell and Chertsey—Woking Electric Supply Company, Limited.
Liverpool—Liverpool Electric Supply Compauy, Limited.
London—North: Camberwell and Islington Electric Light and Power Supply, Limited; County of London Electric Lighting Company, Limited. South: Camberwell and Islington Electric Light and Power Supply, Limited; County of London Electric Lighting Company, Limited. West: Putney and Hammersmith Electric Light andPower Supply, Limited.
Middlesbrough—Middlesbrough Electric Supply Company, Limited.
Oxford—Oxford Electric Company, Limited.
Sheffield—Sheffield Telephone Exchange and Electric Light Company, Limited.
St. Mary, Islington—Messrs. Sharp and Kent.
Walton-on-Thames—Weybridge Electric Supply Company, Limited.
Waterford—City of Waterford Electric Supply Company, Limited.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Saturday, Nov. 28.

(*Before Mr. Justice* A. L. SMITH *and a Common Jury.*)

Hendra v. Chelsea Water-Works Company—Fire-Plugs in Footways.

This was an action to recover damages for personal injuries caused by the defendants' alleged negligence in placing an open fire-plug in the footpath of Bagley Lane, Fulham, situated in their district. The plaintiff, while walking along the footpath, caught her heel in the open hole of the plug, which tripped her up, and she injured her wrist. The defendants' contention was that under section 38 of the Water-Works Clauses Act, 1847, they were obliged to provide plugs for the use of the Fire Brigade; and that the plug in question was a proper one within the meaning of the Act.

Mr. CANDY, Q.C., and Mr. RUSSELL BIGGS appeared for the plaintiff; Mr. COCK, Q.C., and Mr. HOLLAMS represented the defendants.

For the plaintiff, the District Surveyor was called; and he stated that the plugs were dangerous. In the parish of Fulham the fire-plugs were unprotected; but all the modern plugs were covered—some with covers, others with a hinged flap. There was nothing wrong with the plug in question, except in its construction and position. Another witness said there was no reason why the plug should not be covered.

Mr. COCK having opened the case for the defendants,

Mr. *A. A. Gill*, Assoc. M. Inst. C. E., the Company's Engineer, stated that the fire-plugs were now fixed at the request of the County Council. No other pattern than the one in Bagley Lane was used by the Company; and the other London Companies used the same kind. There would be about 40,000 of them in London. Sometimes they were put in the pathway; but mostly in the roadway. Some of the hydrants had covers; but these were liable to get rusted, frozen down, or set fast with mud or dirt. Even where large covers were used, he had frequently seen the necessity for lighting fires before they could be removed.

Cross-examined: There was a certain element of danger in the fire-plugs; and a hinged cover was more dangerous than an open plug.

Mr. *Davis*, the Company's District Superintendent, said the plug in question was down before the footpath was made. It was put wherever the main happened to be.

Mr. *M. W. Hervey*, Assoc. M. Inst. C. E., the Engineer of the West Middlesex Water Company, said his Company had about 5000 of this form of fire-plug. It was, in his opinion, a far better plug than one with a cover. If the road were worn away, the side of the box would stand up. This one being enclosed in wood, the wood would wear down with the roadway. They were, besides, more convenient for the Fire Brigade. His Company did not use any covered plugs.

Mr. *B. G. West*, an Engineer in the service of the Metropolitan Fire Brigade for upwards of 20 years, said the open plugs were the best for the purposes of the Brigade.

Justice SMITH summed up. He said the statute imposed upon the Company the obligation to put down proper fire-plugs; and the question was whether they had done anything which they were not empowered to do. His Lordship read section 38 of the Water-Works Clauses Act, and said it was quite right that the public should be protected from fire, and also proper that the Company should put down fire-plugs. Was the plug when put down (it was not contended that it got out of order) a public nuisance, or was it reasonably safe for persons lawfully passing and repassing along the highway? In considering the question of nuisance or no nuisance, there was one important fact to bear in mind—viz., that in the Metropolis there were 40,000 of these plugs, and that many millions of persons had walked over them since they had been put down. It was suggested that there might have been accidents. The defendants had called persons in their employ, and if there had been any, they would have been brought before them. The Surveyor of the district was called, and said he had never reported to the Vestry that these plugs were improper. The question was whether the one referred to was a nuisance; and if the jury found it was, then they would give a verdict for the plaintiff. If, considering the purposes for which the plugs were put down, they thought they were not a nuisance, then there would be a verdict for the Company.

The jury found for the defendants.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Friday, Nov. 27.

(*Before Sir* P. H. EDLIN, Q.C., *Chairman, and a Bench of Magistrates.*)

London County Council, Appellants, v. Assessment Committee of the Woolwich Union, Respondents.

This was a most important case, involving the question as to the amount at which the Barking deodorizing and outfall works of the Metropolitan main drainage system should be rated, and the principle to be adopted. It occupied the Court the greater part of four days; and it was concluded to-day.

Mr. POLAND, Q.C., and Mr. HORACE AVORY appeared for the appellants; Mr. LITTLER, Q.C., Mr. SINCLAIR COX, and Mr. CUTLER, for the respondents.

The valuation sought to be sustained was £28,800 gross and £23,000 rateable; and the appellants contended that the amount of the rate should be £1000 gross and £667 net. Their principal witnesses were Mr. Henry Robinson, C.E., Mr. A. R. Binnie, M. Inst. C. E., Engineer to the Council, Mr. Santo Crimp, Assistant-Engineer, Mr. R. Vigers, Mr. J. M. Burt, contractor, Mr. Williams, Chairman of the Sewage Committee, and Mr. Young, valuer. Those retained for the respondents were Mr. Dinwiddy and Mr. Marshall, rating surveyors, and Mr. E. K. Burstal, C.E., of Messrs. Stevenson and Burstal, of Parliament Street, Westminster.

The cost of the outfall works was given as £647,623—viz., old

works, £172,222; new precipitating works and machinery, £475,401. The chief items which the appellants claimed to deduct were as follows: Cost of heavy foundations and counterforts, £89,860; coverings to reservoir, £98,6c4; culverts, &c., £53,671; machinery, £20,975; depreciation of machinery, £4955; works outside the parish boundary, £39,114—total, £307,179. It was alleged that much of the actual cost of the works was unnecessary and extravagant; that new methods of treating the sewage rendered seven-tenths of a considerable portion of them superfluous; and that, under any circumstances, they could not produce profit. The quantity of land occupied by the works is 53 acres, which was estimated by Mr. Vigers at £300 per acre; and this figure the respondents did not dispute. The point which arose on the evidence was what percentage ought to be taken on the various items to arrive at the rent. The Bench intimated that they should not allow the cost of exceptional foundations to be deducted.

Mr. POLAND addressed the Court, and contended that, as the appellants were always able to borrow money at 3 per cent., if they were the tenants they would not pay a rent of more than this amount on the structural cost and the capital value of the land. They were the only possible tenants; and the landlord would have to take what they were ready to give. Three per cent., therefore, would give the right rateable value.

Mr. LITTLER, in reply, intimated his intention not to call witnesses, having, as he considered, proved his case from the cross-examination of the appellants' witnesses and the practice of the County Council itself in respect of the rating of School Board and other premises; and he asked the Court to affirm the rate at 5 per cent. on the value of the buildings, and 4 per cent. on the value of the land.

The Court, after a short adjournment, decided on allowing some deductions in respect of portions of the works which were useless, and fixing the rate at 3 per cent. on land and 4 per cent. on buildings; or a total of £20,567 gross, and £17,139 net value.

Mr. Adolphe Crosbie, of Wolverhampton, has been favoured by the India Office with a contract for a supply of his paints for the Public Works Department.

The Value of Taunton Electric Lighting Shares.—On Friday, the 27th ult., 24 shares of £5 each, fully paid, in the Taunton Electric Lighting Company, were offered for sale by auction in that town. One bid of 2s. 6d. per share only was made; and no second bid being forthcoming, the shares were withdrawn.

Increased Consumption of Gas at Smethwick.—A report of the Gas Committee of Smethwick Local Board states that the sale of gas for the nine months ending Sept. 30 last shows an increase of 3,514,400 cubic feet, with a rise of £576 in the gas-rental, as compared with the corresponding period last year. The sale of residuals, &c., also shows an improvement to the extent of £506.

Failure of the Electric Light at Cannon Street Hotel.—During the first smoking concert for the present season of the Civil Service Vocal Union, in the Great Hall of the Cannon Street Hotel, last Thursday evening, much inconvenience was caused by the failure of the electric light. Fortunately one of the sun gas-burners was alight; so that the large hall was not thrown into total darkness; and the attendants at once lit up the remaining burners. About a quarter of an hour later, the electric light again came on; but until nearly the close of the concert, it was very unsteady.

Rhyl Water Supply.—It will be seen, from the list of notices of intended applications to Parliament next session which appear elsewhere, that the Rhyl District Water Company are about to promote a Bill for the expenditure of capital for the improvement of their works, while the Rhyl Commissioners are desirous of purchasing the undertaking by compulsion or otherwise. At a conference which has taken place between the parties, it was decided that the Commissioners should make an offer; and if it should be satisfactory to the Company's Engineer, the property is to be amicably transferred and the Bills abandoned.

Increased Storeage at the West Bromwich Gas-Works.—At the meeting of the West Bromwich Town Council last Wednesday, the Gas Committee reported that the Town Clerk had informed them that it would be necessary to promote a Bill next session to enable the land proposed to be purchased on the Mill Farm Estate to be utilized for the manufacture of gas and residual products. As possession of the land could not be obtained in sufficient time to provide and erect an additional holder for the winter of 1892, the Committee resolved to put up in the gas-works a third holder, of a diameter of 120 feet, to be constructed in two lifts, and to have a capacity of about 700,000 cubic feet, which it was estimated would meet the requirements of the borough for the next nine or ten years. The holder is to be built so as to be capable of being converted into a three-lift one when the necessity for so doing arises. Tenders and designs are to be submitted to the Committee early next year.

The Supply of Water to Licensed Victuallers at Wakefield.—Last Wednesday a case of some importance to licensed victuallers was brought under the notice of the Wakefield City Justices. For some time past there has been a dispute between the Corporation of the city and the Wakefield and District Licensed Victuallers' Association with regard to the high prices charged to licensed victuallers by the Corporation for water; and the action was brought as a test case. The defendant was Mr. Martin, the proprietor of the Bull Hotel (the largest licensed house in the city), and formerly a member of the Corporation. He was summoned by the Corporation for taking water belonging to them without an agreement. Mr. Hudson (the Town Clerk) prosecuted, and Mr. Plews appeared for the defendant. The Town Clerk submitted that, as Mr. Martin carried on a trade or business, he was not entitled to a domestic supply of water on the domestic scale, and ought to have entered into an agreement with the Corporation. Mr. Plews argued that the defendant did not use water for the purposes of "trade, business, or manufacture," and that he was entitled to a supply on the domestic scale or by meter. The Bench held that it was a trade supply, and fined the defendant 1s., and he had 18s. 6d. costs to pay. Notice of appeal was given

MISCELLANEOUS NEWS.

DISASTROUS GAS EXPLOSION AT BLACKBURN.

Loss of Life and Destruction of Property.

About four o'clock on Monday afternoon of last week, a terrible gas explosion occurred at Blackburn, which resulted in a lamentable loss of life and the demolition of the Crown Hotel and an adjoining shop, where cheap articles were sold. The block of property in which the explosion took place is situated in the central portion of Blackburn, and is among the finest in the town. The buildings consist of three storeys, and are about 50 feet high. The shop and the destroyed portion of the hotel had a frontage of about 50 feet; so that a huge breach has been made in the block. The hotel was essentially a market house—an old-established hostelry abutting on the market square. It was one of the busiest hotels in the town on market days; and at one time the stallholders on the market ground were largely dependent upon it for their supply of hot water and gas—the gas passing through a large meter which was the cause of the disaster. As the meter was no longer required—the small stall-holders having arranged to be supplied in each case through a meter of their own—it was decided to remove it; and a man named Mark Robinson went to disconnect it. He had cut the connecting-pipe, and feeling that the escape of gas was overcoming him, he ran out of the premises and gave the alarm, saying, "Cut this, lads; there's going to be an explosion." In a few minutes the explosion he feared occurred, the report being so loud that it was distinctly heard more than three miles away; and the hotel and shop were instantly reduced to ruins. It is stated that Robinson, who is a fruiterer and greengrocer, bought the meter, and went to disconnect it, but neglected to take with him a qualified gas-fitter. On detaching the meter, he became alarmed at the escape of gas from the large service-pipe, and ran out of the premises shouting incoherently. The gas rushed out in such volume as to quickly fill the basement; and the explosion followed before the people in the hotel knew what was the matter.

At the time of the explosion, there were several persons in the hotel and the shop; the former of which was occupied by Mr. Houghton, and the latter by Mrs. Wilkinson and Mr. T. Lightbown. The escaping gas caught fire; and the services of the fire brigade were requisitioned. There were hundreds of willing workers; but the work of rescue could not be commenced owing to the fire, which defied the efforts of the brigade to subdue it. It was found impossible to cut off the gas supply; and as soon as possible men were set to work to open the roadway, and thus stop the gas at the main. As the fire continued, the work of removing the *débris* was hindered; and as it was known there were persons buried in the ruins, the utmost excitement prevailed. Among the first to be removed was Mrs. Houghton. She was in the kitchen when the gas exploded, and had a miraculous escape. She did not, however, escape injury, her arms being severely cut. Jessie Stones, a barmaid, was also in the kitchen, and the mantelpiece fell on her, and crushed the lower part of her body. A man named Dugdale was taken out of the cellar in an unconscious state, and with a deep wound in his head. Dugdale, it is reported, was in the passage of the house, and fell into the cellar with the *débris*. The firemen, and those who were helping in the work of searching, effected an entrance underneath the adjoining shop, and at length found that there were still some persons alive among the *débris*. After about two hours' work, Mr. Lightbown and Mrs. Wilkinson were safely taken out of the ruins. Later on a customer (a Mrs. Buckley) was found lifeless; and four hours after the explosion Mr. Houghton was rescued. On Tuesday morning four other bodies were found—making a total of five killed, and ten injured. The names of the victims are: Killed—Eleanor Buckley, married, aged 57; William Fielding, a tailor, aged, 60; Henry Smithson, aged 52; James Patterson, a draper, aged 50; and John Casey, a tailor, aged 75. Injured—Mr. and Mrs. Houghton of the Crown Hotel; Mrs. Wilkinson and Mr. Lightbown, occupants of the shop; Jessie Stones, Maggie Makin, and Annie Eliza Banks, barmaids; William Dugdale, a pork butcher; W. H. Aspden; and Edward Grimshaw, an ostler. The hotel is the property of Alderman Rutherford, an extensive brewer, who, the day after the accident, informed the Chief Constable that he wished to defray the funeral expenses; and the relatives—with the exception of Mr. Buckley—accepted the offer. James Patterson was interred on Thursday, Mrs. Buckley, Henry Smithson, and William Fielden on Friday, and John Casey on Saturday. For the victims and their families, the utmost sympathy prevails in Blackburn.

Acting on the advice of his Solicitor, Robinson, on Tuesday morning, surrendered himself to the police as the man responsible for the catastrophe. He stated that he was engaged in cutting off a 3-inch pipe from the gas-meter in the vault of the Crown Hotel, when the rush of gas overpowered him. Feeling that he was about to be choked, he ran into the street, warned some bystanders, and went off to the gas offices close by. He was returning to the hotel when the explosion occurred. Later in the day Robinson was brought before the Magistrates on a charge of causing the deaths of Mrs. Buckley and others. Mr. Withers, who prosecuted on behalf of the police, said he was not in a position to present the case; and, as the inquest had not been held, he asked the Bench to remand the prisoner. Mr. Crossley, who defended Robinson, raised no opposition; and the Mayor granted bail in one surety of £100, and prisoner's own recognizances of £100, or two sureties of £50. On Friday, Francis Robinson, brother of Mark, who was assisting in disconnecting the meter, also surrendered himself to the police as being part author of the disaster. In the afternoon, both prisoners were charged at the Police Court, and remanded for a week.

The inquest on the five persons killed by the explosion was opened by the Coroner (Mr. Robinson) at the Blackburn Town Hall on Wednesday. Mr. Withers watched the inquiry for the police, Mr. Crossley for Mark Robinson, Mr. Costeker for the owner of the Crown Hotel, and Mr. Riley represented Mr. Buckley and Mrs. Patterson. The Coroner said the inquiry would occupy a considerable time; but that day he only proposed to take such evidence as would enable him to

adjourn the inquest. It was not intended to go into the cause of the explosion at present. Evidence of identification having been given, Police Superintendent Byrne stated that Mrs. Buckley was suffocated. From the position in which they were found, he thought the other four persons were in the vault of the Crown Hotel when the explosion took place. Their bodies were greatly disfigured. The inquest was then adjourned until next Thursday.

GAS EXPLOSION AT GLASGOW.

Last Thursday morning, a serious explosion of gas occurred in a sewer in course of construction in connection with the Central Railway, at the junction of Bishop Street and Main Street, Anderston, Glasgow, which resulted in the main thoroughfare being blocked and the stoppage of all through traffic. At the spot where this work was going on, there are two gas-pipes—an 18-inch and a 10-inch. About seven o'clock in the morning, Henry Moulson, the foreman in the employment of the contractors, went to his work in the usual course, and as it was dark, he carried a lighted lamp. A strong smell of gas was noticed in the street by the workmen; but this did not receive much attention. Moulson proceeded along the side of one of the shafts, when all at once a violent explosion occurred, evidently caused by the lamp igniting on the surface the gas which had issued from the shaft. This communicated with the workings underneath; and these also being full of gas, the convulsion passed under the street, through the workings, to a shaft at the other side, and found an exit by blowing violently into the air a wooden platform which covered it. Several persons were passing at the time; and, naturally, considerable alarm was caused. However, no serious injuries to these persons seem to have happened, although the foreman, Moulson, and two labourers, who were along with him, were burned about the hands and face. Two policemen and a joiner also suffered from the platform being thrown into the air. The most serious damage seems to have been done to the inside workings and to the street above. When the fire brigades arrived on the spot, it was found that the 18-inch gas-pipe was alight, and had caused the woodwork of the workings which supports the street to become ignited. It was several hours after the explosion occurred before the gas officials were able to dig down to another portion of the pipe and stop the flow of gas. The statements as to the cause of the escape of gas in the first place are somewhat conflicting. The information in the possession of the police, however, is that a water-pipe burst during the night, and that the water from it undermined the gas-main, causing it to collapse and give way at the joints, the gas thus escaping and filling the workings.

BRITISH WATER-GAS UNDERTAKINGS.

The annual report of the Directors of the British Water-Gas Syndicate, Limited, states that not a single thing has occurred to weaken their faith as to the success of the application of water gas manufactured under the patents held by the Company. The Uddingston works show a profit. The bankers of the Syndicate consented to advance £10,000 on the security of the uncalled capital; and on Sept. 30 last the overdraft was £8398 14s. 3d. At the date of this advance, none of the contracts were completed; and it was thought politic by the Directors to raise the necessary working capital temporarily in this manner, rather than press the sub-companies for the moneys due from them. Since the date to which the balance-sheet is made up, the North British Water-Gas Syndicate, Limited, has paid the British Syndicate £5000 on account of the plant erected at Messrs. J. Spencer and Sons, Limited, for use in steel making; and moneys will also, the report states, shortly come in from the Yorkshire Water-Gas Company, Limited, on account of completed contracts. As the result of the twelve months' operations does not allow of a dividend being declared, the Directors, under the circumstances, express their willingness that the fees to which they are entitled for their year's services should be held in suspense.

The report of the Directors of the North British Syndicate, which will be presented to the shareholders at the ordinary general meeting to be held in Glasgow next Tuesday, is very much on a par with the one above noticed. It is stated therein that, owing to causes beyond the control of the Board, very little progress has been made in the development of the business. The installation of plant at Messrs. Spencer's, referred to above, although completed some months ago, has only recently been started; and hope is expressed that this and the puddling furnace erected for working with water gas at the St. Rollox works of the Glasgow Iron and Steel Company, which is nearly finished, will prove successful. The Directors and the staff have, it is stated, been doing their best to secure contracts for supplying other water-gas plant within their district; but before giving orders, manufacturers naturally prefer to await the results of the installations above mentioned. The accounts accompanying the report show a balance of £670 at the debit of profit and loss. In last year's report, it was stated that the Directors had decided to place £807 to the preliminary expenses account. This has now been increased by £671, part of a sum of £1250 carried to the suspense account for law charges; making a total of £1478. As in the case of the British Syndicate, the Directors have not drawn any fees for their services; and they assure the shareholders that the general expenses have been kept as low as possible.

The Quality of the Dublin Water Supply.—According to the *British Medical Journal*, the conductors of which have caused full inquiries to be made into the matter on the spot, there cannot be much doubt that the attack of typhoid fever from which Prince George of Wales is now recovering was contracted during his visit to Dublin, and is traceable to the defective quality of the water supplied for drinking purposes in the city.

LEEDS CORPORATION CONSOLIDATION BILL.

The Inspection of Gas-Fittings—The Illuminating Power of the Gas.

The Leeds County Council have recently held three meetings to discuss the various clauses of their Consolidation and Improvement Bill; and at a fourth meeting last Wednesday, they unanimously adopted the Bill, as amended.

The section dealing with the Gas Department came before the members last Friday week. After clauses referring to the manufacture and sale of residual products, and gas fittings and apparatus had been passed, a discussion took place on the clause giving the Corporation power to inspect gas pipes and fittings in new buildings before they were plastered or covered over, twenty-four hours' notice of the intention to cover them up to be given; and further, enabling a duly-appointed officer of the Council to prohibit any arrangement, or the use of any pipes or fittings, which, in his opinion, would be likely to occasion any waste, misuse, or undue consumption of gas. Mr. Ambler strongly objected to the clause, contending that it would cause a serious delay in all building operations. He thought plumbers were now to be depended on as much as any inspectors who might be appointed. He moved that the clause be omitted. Alderman Spark described the clause as one inserted in the interest of tenants. They were often put to very serious inconvenience in consequence of slovenly work done by plumbers. If he had his way, he would not have any gas-pipes plastered up; and he considered the clause was a most reasonable one. Mr. Gaunt thought it would be a very serious mistake if the Council allowed the clause to be struck out. Mr. Harland held that after the Corporation had carried the gas to the meter of the house, they had done their duty, and ought not to go beyond it. He wanted them to guard against interfering with private rights; and this clause gave a power to the Corporation, through their inspectors, which was entirely unwarrantable. Mr. Hunt said they knew there were a number of jerry builders, who would put in anything; and the Corporation ought to have power to see that houses were properly fitted up. The Mayor, Sir Edwin Gaunt, and Alderman Baker supported the resolution. Mr. Hannam did not object to the clause; but he did object to men going and inspecting the work at a time when it was completed and ready for the occupier to take possession, because all the damage would be done afterwards. Mr. Henry observed that the Gas Committee received hundreds of complaints during the year that there was a defective supply of gas; and they sent men at very serious cost to ascertain the cause, and it was often found to be due to the defective fittings. A vote was then taken; and Mr. Ambler's amendment was rejected, only four members supporting it. The clause was then approved of.

On Monday of last week, the Council resumed consideration of the Bill; and discussed sub-section 5 of section 114, referring to the illuminating power of the gas. Alderman Harrison read the sub-section, as follows: "All gas supplied by the Corporation shall be of such quality as to produce, from an Argand burner having 24 holes and a 6-inch chimney, and consuming 5 cubic feet of gas an hour (or from other approved burners or apparatus), a light equal in intensity to the light produced by eighteen sperm candles of six to the pound, burning 120 grains an hour." He remarked that the Parliamentary Committee asked the Council to alter the word "eighteen" to "nineteen," and he moved the clause as altered by that Committee. Alderman Lowley asked by what authority the Parliamentary Committee took upon themselves to change the word after it had been approved by the Gas Committee. Alderman Harrison said he understood at the time that the Parliamentary Committee made the alteration to meet a private arrangement, which might or might not last, with the Magistrates. As to the alteration, he did not wish to say anything, but left it entirely to the Council. Alderman Gilston said it might be that the Parliamentary Committee had a right to recommend over and above the Gas Committee, who were supposed to know at least as much about these matters as the Parliamentary Committee. The Gas Committee unanimously determined that they would recommend to the Council that the illuminating power should be 18 candles; and that they did on this ground: At the present moment the gas should be of 16-candle power, tested by a 15-hole Argand burner; but they found by experience that an equivalent to 16 candles by a 15-hole burner, tested by a 24-hole burner was as near 2 candles as one could get it; and they thought that to increase the parliamentary standard by 2 candles was near enough for all practical purposes, inasmuch as, whatever Parliament might say was a minimum, the Council could at any time say what was to be the maximum, and it might go from 18 candles to 19, 20, or 26 candles if they wished it; and no Committee appointed by the Council would dare to make 18-candle gas for any length of time if the Council said it was to be 22 candles. He wished the Council to be able to deal with the matter from time to time as they desired. At the present time to obtain 19-candle gas meant 2d. per candle, from 17 to 19 candles; whereas all below that meant a penny and a fraction. That arose in this way. If they made the gas which they could manufacture of 17 candles from ordinary coal, they could buy that coal at an average of something like 10s. per ton; but they had to pay from 15s. to 18s. per ton for coal to bring the illuminating power up to 19 candles. Cannel coal was becoming more scarce and dear every year; and the time might come in the face of the great consumption of gas that they anticipated for heating purposes in the town, when light would not be so much required as heat. He really thought it would be better for the Council if they said 16 candles, instead of 18, so that they might be able to reduce the illuminating power if they required. The Council determined that the illuminating power should be 19 candles; and the Committee had faithfully carried out the resolution. The average of the daily tests made at the works during last year was 19·42 candles. He moved, as an amendment, that the illuminating power should be 18 candles. Alderman Spark said this was simply a desire on the part of the Gas Committee to reduce the illuminating power of the gas. If the gas was poor, they must consume a larger quantity; and, therefore, there would be more injury to health. Mr. Henry said the Gas Committee were prepared to maintain the illuminating power of the gas at 19 candles; but if the parliamentary standard was fixed at 19 candles, the Committee

would have to work up to 22 candles, and the cost would be considerably increased. He hoped the Council would not allow the Parliamentary Committee to alter what the Gas Committee had agreed to unanimously. They asked that an 18-candle standard should be inserted, so as to allow them a certain margin to work upon. To make the parliamentary standard 19 candles would place a tax upon a class of persons who had to pay heavily for gas to drive engines and for cooking purposes. Sir Edwin Gaunt spoke in favour of the resolution. Alderman Gilston said they did not want to go down to 18 candles. The Council had said the illuminating power should be 19 candles, and they did not ask to alter it; but they were seeking for a minimum. A vote was then taken for the amendment, when 26 members supported it; and it was declared carried.

THE ELECTRIC LIGHTING SCHEME FOR THE CITY OF LONDON.

At the Meeting of the Commission of Sewers of the City of London last Tuesday—Mr. S. Scott in the chair—the application of the City of London Electric Lighting Company for an extension of time of at least one year for carrying out the public lighting of the City, to which reference was made in the JOURNAL last week, was under consideration. Mr. J. L. Sayer moved that the letter should go to the Streets Committee. Mr. Treloar said he thought that the application was a preposterous one, and that the Commission would be the laughing stock of the community if they acceded to the request. It was quite time they knew where they were with regard to the matter. Mr. Morton, M.P., considered that the delay had all arisen from the promotion of Companies to which the contracts had given rise. No sooner were the contracts signed, than they were handed over to another Company, who in their turn passed them on to the present Company after making an enormous profit for themselves. If the Company did not complete their contracts, the Commission ought to declare the deposit of £3000 forfeited, and annul the contracts. Mr. C. T. Harris reminded the Commission that he warned them at the time the contracts were entered into that the original Companies were not in a position to carry them out; and it would be a fortunate thing for the ratepayers if the opportunity arose to cancel the contracts, which were distinctly to their disadvantage. Mr. J. E. Sly thought the Company ought to be told that no extension of time would be given them, and that the Commission would not assist them in any object they might have of raising more capital. Mr. Bedford said that the contracts had been transferred once or twice since they were given out; and the present Company had paid an extravagant price for them. Owing to the delay which had arisen, it was simply impossible for the contracts to be completed by next February. He would consent to an extension for a month or two, with the condition that for every week afterwards the Company should be under the strictest monetary penalties. Mr. Treloar asked why Sir J. Savory, who was Chairman of the Pioneer Company, which first took over the contracts, was not present that day to explain their action in the matter. Eventually, after a long discussion, it was resolved, on the motion of Mr. Wallace, that the request of the Company could not be entertained at the present time.

THE LONDON COUNTY COUNCIL AND METROPOLITAN ELECTRIC LIGHTING SCHEMES.

The Proposed Loan to St. Pancras.

At the Meeting of the London County Council last Tuesday—Sir J. LUBBOCK, Bart, M.P., in the chair—the Finance Committee presented a report on the application from the Vestry of St. Pancras for sanction to borrow £60,000 for electric lighting works, to be repayable in 42 years. They had previously reported on the cost (£62,999) of the proposed works, and recommended a loan of £56,300, repayable as to certain parts in varying periods of 5, 8, 15, and 30 years; such varying periods being fixed, on the advice of the Engineer, with reference to the probable life of the work on which the expenditure would be made. In consequence of the discussion which took place at the Council on the 17th ult. (*ante*, p. 956), the Committee had seen a deputation from the Vestry, who had pointed out to them that the works, as a whole, would make up a permanent concern, and must, whenever necessary, be renewed from time to time out of the Vestry's funds, so as to be kept always in good working order. They pointed out to the deputation that the Council were under their present powers, precluded from granting loans for works for a longer period than 30 years, except for street improvements and bridges; but, while admitting this, they urged, in view of applications likely to be made by other parishes for loans to carry out similar works, that the Council should obtain statutory authority to grant loans spread over a period not exceeding 60 years. Under these circumstances, the Committee considered that it would be better for the Council to authorize the Vestry to borrow elsewhere than from the Council the sum of £60,000; leaving open the question of the Council advancing this sum if parliamentary authority was obtained for a longer period than 30 years. They recommended: (1) "That the sanction of the Council be given under seal to the borrowing by the Vestry of St. Pancras of the sum of £60,000 towards defraying the cost of certain electric lighting works, at a rate of interest not exceeding 4 per cent. per annum, and the principal being repaid by equal annual instalments within a period of 42 years from the date of the loan." (2) "That the Council do apply to Parliament for power to make advances for electric lighting purposes to Vestries and other rating authorities within the County of London, for periods not exceeding 60 years; and that it be referred to the Parliamentary Committee to take steps to obtain the necessary statutory authority for that purpose."

Mr. CAMPBELL said the duty of the Council with regard to these loans was to see that the future was not unfairly burdened, and that the present generation were not allowed to "play ducks and drakes" with the money of posterity. The St. Pancras Vestry deserved the greatest credit for getting the Provisional Order to carry out their own electric lighting. In Kensington they did the same; but the difficulties and dangers seemed to them to be heavier than they were inclined to bear. Electric lighting, he considered, could best be provided by private companies, if they were not allowed too much tether. Electric lighting was comparatively in its infancy; and it was impossible to say what the lighting of London would be in the next 10 or 15 years. It probably would be electricity; still it was not yet so well established as gas was 20 or 30 years ago. He thought it fair, honest, and right that the Council should discuss the matter fully, and that they should know what they were about before they put these burdens on the ratepayers of another generation. He moved, as an amendment, that the report be referred back to the Committee for further consideration.

Mr. J. LLOYD seconded the amendment, as he objected to the Council departing from the principle they had laid down as guiding them in making loans. In this case they would have their capital in property which would be wearing out.

Mr. OSBORN supported Mr. Campbell's proposition. It seemed to him, he said, an extraordinary thing that they should take out of the rates sums of money to put up plant of very short life, and spread the repayment over 42 years. Hitherto they had taken great care in granting money to local authorities to see that there was ample security for the money. In the case now before them, they had none whatever. The parish of St. Pancras was starting with considerable doubt as to the success of the project; and they ought to remember the advances that would take place in electric lighting, which would involve alterations. In his opinion, they should not go beyond 12 years; and certainly in no case ought they to exceed 15 years.

After some further remarks,

Lord LINGEN, Chairman of the Finance Committee, said it was seldom that he appeared before the Council to advocate a long, in preference to a short period of repayment. His own opinion was most strongly, as a rule, in support of short periods. This doctrine had not always been readily welcomed there; and he hoped, after the feeling which had been shown on the proposal, that it would receive more favour in future. They had told the applicants that, with their present powers, they could not lend to them for more than 30 years. It was impossible for the Council to shut their eyes to the fact that the example which St. Pancras set in this matter was an extremely important one. Parliament had expressed an opinion on the whole favourable—certainly not unfavourable—to the idea that the municipalities should undertake for themselves, and not leave to comparatively independent companies, such undertakings as involved the breaking up of the streets. This, he thought, was a sound policy. Supposing the Vestry of St. Pancras did not go into the open market to borrow this money, the only alternative was that they must go to Parliament; and he himself rather leaned to the idea that they should go there. The Council, therefore, by adopting the recommendations of the Committee, did not commit themselves to any very dangerous precedent.

The amendment was rejected; and the recommendations of the Committee were agreed to.

LIVERPOOL CORPORATION WATER SUPPLY.

Mr. Deacon's Engagement.—The Expenditure on the Vyrnwy Works.

A long discussion took place at the monthly meeting of the Liverpool City Council last Wednesday on a recommendation of the Water Committee that the engagement of Mr. Deacon as Engineer of the Vyrnwy works should be continued until June 30 next, that he be paid for his services £875, with an allowance for actual railway and cab fares, and that he be further engaged for a period not exceeding two years as Consulting Engineer in connection with the works, at the rate of £500 per annum. Alderman John Hughes, in moving the adoption of the recommendation, spoke of the satisfactory manner in which Mr. Deacon had discharged his duties since he became associated with the Corporation in 1871. An amendment was moved by Mr. Watts, that Mr. Deacon's salary be £1000 a year, or rather £500 for the next six months, and that he be retained as Consulting Engineer for twelve months after the expiration of that period. This having been seconded, some of the members commented upon the amount of time that Mr. Deacon devoted to the work of the Corporation; Mr. Doughan remarking that it seemed to him that, in consequence of Mr. Deacon having been unable to give that close attention to the work which ought to have been given, the city had been saddled with an expenditure, and had paid for an amount of work in connection with the Vyrnwy scheme, which was now admitted on all hands to have been improperly carried out. Other members protested against this "attack" on Mr. Deacon; Alderman Garnett observing that the errors which had been alluded to were not those of the Engineer but of the contractors. Ultimately the amendment was withdrawn; and words to the effect that Mr. Deacon give such time to the work of the Corporation as the Water Committee may require, having been added to the resolution, as well as the substitution of eighteen months for two years, it was agreed to.

From a summary of the return of the expenditure of the Water Committee for the three months ended on Sept. 30 last, it appears that £1066 was expended on the Vyrnwy embankment works and works in connection with the reservoir—making the net total £333,929. The Vyrnwy quarry still stands at £201,262 net; while on the aqueduct in the course of the three months, £24,391 was expended—bringing the net total up to £1,037,611. On land and easements, £391 were spent; making the total £281,203. The total amounted to £2,054,006. Adding to this the expenditure on the Vyrnwy estate and hotel, makes the grand total £2,089,388.

Gas Explosion at New Jersey (U.S.A.).—The explosions of gas which occurred in Great Britain last week do not stand alone in this class of disasters. Last Friday morning, an alarming explosion took place at the Jersey Terminus of the Pennsylvania Railway, the result of which was the destruction of an enormous train-shed by the resulting fire. The flames spread to the interior of the station; and great damage was done—the loss amounting, it is stated, to £10,000.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

After the tornado of the previous month, the meeting of the Edinburgh and Leith Gas Commission on Monday last was a humdrum affair. Mr. Wells was present; but having secured that the objects which he had desired inquiry into should be looked after, he scarcely opened his mouth. The new Commissioners who have been appointed by the Corporations took their seats. The reports by the Engineers showed that the output from the Edinburgh works during October was 101,100,000 cubic feet, an increase of 6,847,000 feet; and that from the Leith works the output was 34,114,000 cubic feet, a decrease of 8,163,000 feet—making a total decrease for the month, as compared with October last year, of 1,316,000 cubic feet. They also showed that Mr. Mitchell, in Edinburgh, got 9959 cubic feet of gas out of coal costing 18s. 5·6d. per ton, while in October of last year he got 9789 cubic feet out of coal costing 15s. 1·55d. per ton; and that Mr. Linton, in Leith, got 10,502 cubic feet out of coal costing 18s. 9¾d. per ton, against 10,081 cubic feet out of coal costing 12s. 9¼d. per ton. The illuminating power of the Edinburgh gas was 26·09 candles, as compared with 25·69 candles; and of the Leith gas, 26·57 candles, against 26·60 candles. Of the other business taken up, was the remit made a couple of months ago to inquire into the price of gas coal in other large towns, regarding which Bailie Steel stated that they had a report on very much the same lines a few months ago; and the Works Committee thought it better to delay the inquiry for a little, because before the time of entering into coal contracts they would have other reports before them, from which they would get a great deal of the information they desired. This looks like shelving the subject altogether, which is the best thing they could do. It would be too bad if the Gas Commissioners of the capital of Scotland should set about practising the circular-inquiry nuisance. Mr. Kinloch Anderson was appointed Convener of the Works Committee, in room of Bailie Steel; and Provost Aitken was re-appointed Convener of the Law and Finance Committee. The only other business of any importance before the Commissioners was a motion proposing that fuller details should be given in the annual balance-sheet. This is certainly a step in the right direction; but why not make it monthly that information should be given? If I had any say in the matter, I would put a stop to the Clerk reading over the agenda, and make it the duty of the Convener of each Committee to briefly report what his Committee had been doing during the preceding month. That would give opportunity for criticism or remark, which is scarcely possible at present unless one has an intimate knowledge of gas matters. I venture to say that at present Commissioners come to the meetings and go away without knowing much of what has been done; because all the information they get is contained in a bald minute. Perhaps this reform may, like others which have already been conceded, be also obtained.

As showing what I would call the want of sense on the part of some public men, I would mention an incident which occurred at the Leith Town Council on Tuesday. Mr. Banter moved that the Council ask their representatives in the Gas Commission to corroborate or deny "the grave charges of gross mismanagement" made by Mr. Wells at recent public meetings. Provost Aitken, as a Gas Commissioner, said the charges fell to the Gas Commission to consider; and he added that he had received a letter from Mr. Wells, who is no longer a member of the Leith Town Council, pointing out that before the Council passed such a motion, his statements should be verified. Bailie Archibald said that, as a Gas Commissioner, he would decline to answer the question as it was put. Upon pressure, Mr. Baxter withdrew his motion, which saved the reputation of the Council; because it would have been a foolish thing to have put the burden upon their representatives in the Gas Commission of giving an answer to charges which are at present under inquiry by the Commission.

The Analyst whom the Dundee Gas Commissioners appointed last autumn has already shown some fruit of his labour; but whether it will result in benefit to the Commission or in litigation, remains to be seen. In a report which he submitted to the Commissioners on Wednesday, the following results were brought out regarding seven samples of coal, the contractors' figures being given first and the results arrived at by the Analyst after: 28·32, 21·56 and 25·62; 24·23, 15·15 and 19·83; 22·36, 16·64 and 14·25; 29·21, 20·85; 24·54, 13·51; 34·09, 30·36; and 25·12, 16·25. Ex-Provost Brownlee, the Convener of the Works Committee, said they had resolved to reject some of the coal, and to contract anew; and they proposed to deal with the contractors whose coal was very much below the quality contracted for. Besides being of low illuminating power, the coal also yielded less gas per ton than had been contracted for. Some of the contractors had admitted that they were at fault, and had compromised with them. In order to keep the Commissioners safe, they had sent samples of the coal to a neutral analyst; but up to the present time they had received no reply from him. They would require to deal with six contractors in all. In Glasgow, he added, the Gas Committee dealt directly with colliery owners, and not with middlemen as in Dundee; and they in Dundee were gaining experience which was leading them in the same direction. They contemplated they would require to advertise for 10,000 tons of coal, to take the place of that which they had rejected. The Commission granted power to do this. This is all very well, and it is right that the Commissioners should see that they get what they contract for; but why, if a neutral analyst has been called in, should the Commissioners not wait for his report? Suppose his report should not bear out their analyst in his results, or that the coal contractors should refuse to accept either of their analyses, and maintain that, on the strictly legal interpretation of their contract, they were not in fault, where would the Commissioners be?

Mr. John S. Gibb, the painstaking and conscientious Treasurer of the Edinburgh and Leith Gas Commission, is devoted to the study of antiquarianism, a subject on which he spends many hours after his laborious duties in the gas office are over for the day. On the evening of Wednesday last he lectured to the Edinburgh Branch of the British Typographia on "James Watson, an Edinburgh Printer of Two Centuries ago;" and he delighted his audience with his narrative of the life-work of the man who was the pioneer of book-printing in Edinburgh. Mr. Gibb was able to exhibit several specimens of Watson's works, which were looked upon with interest by the fraternity.

An £8 annuity of the Dundee Gas Commissioners has been redeemed for £240. The redemption of annuities is a slow process; and the Commissioners, since 1868, have been able to reduce their annuity indebtedness of £216,000 by only something like £25,000. The price has risen from 25 years' to over 30 years' purchase; but this is simply a form of penalty which prosperous corporation gas undertakings have to pay, and consequently the result is not altogether without its comforting side.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

The Town Council of Glasgow, in its enlarged and reconstituted form, had quite a field day on Thursday; the meeting on that occasion bringing forth a "full-dress" debate, nominally based on the Gas Committee's minutes, but really on those of the Sub-Committee on Electric Lighting. Councillor Colquhoun, who was the local solicitor for the House-to-House Electricity Company (now defunct), several months ago set himself forward to challenge the policy of the Electric Lighting Committee on the question of low tension *versus* high-tension electricity for the Glasgow electric lighting scheme; and accordingly he gave notice of a motion which has been "on the cards" for about four months, but was postponed once or twice at the request of the Convener of the Committee, who is a user of electric light (got through the medium of a gas-engine) in his own mansion, and is therefore regarded as in a measure an authority on the subject. When the minutes of the General Committee on Gas and Electric Lighting for the past two months had been formally moved for adoption by Mr. Convener Ure, and seconded by Councillor Alexander, Mr. Colquhoun moved, as an amendment—"That the resolution come to at the meeting of the Town Council held on June 4, 1891, with reference to the electric lighting installation to be put down for the supply of the compulsory area of the city, be rescinded; and that it be remitted to the Gas Committee to reconsider the question as to what system of electric lighting will be best for the whole city, and to report." Since the amendment was first tabled, several things have happened, and especially have the Electric Lighting Committee pursued the even tenor of their way, the more so as they were fortified by Sir William Thomson in their disposition and even their resolution to adopt the low-tension system in the compulsory area scheduled by the Electric Lighting Provisional Order of last year. One of the Committee's most decided forward actions has been the engagement of Professor A. B. W. Kennedy, F.R.S., of London, to devise a scheme of lighting on that system, both for the compulsory area and for some of the western districts of the city. That gentleman is preparing his plans and specifications for a central station and plant capable of providing current for at least 12,000 8-candle lamps, with fittings equal to a capacity of 20,000 lamps. Furthermore, the Committee went on to make a conditional purchase of a site for the central station about one-third of a mile west of the scheduled compulsory area, the cost of which is reported to be about £8000. Such overt acts as these rather handicapped Mr. Colquhoun when he came to speak in support of his amendment. Two or three members backed him up, and there was some excellent speaking in defence of the action of the Electric Lighting Sub-Committee. When the division was taken at the close of the discussion, it was found that Mr. Colquhoun was in a hopeless minority; his amendment receiving only 7 votes, as against 56 for the adoption of the minutes—two members declining to vote. It is reported that urgency will now be the rule with the Sub-Committee; so that current may be available for those who want it by next August, and before the term allowed by the Provisional Order expires.

The Hamilton Corporation Gas Committee have begun to see that they must soon make an extension of the gas-works belonging to the burgh; and at the monthly meeting of the Town Council held on Thursday evening, they reported to that effect. It was shown by a report from Mr. Johnstone, the Manager, that the works were being taxed to their utmost capacity in order to meet the increasing consumptive demand. He detailed the points where an extension was urgently necessary. Mr. Tainsh, a former Convener of the Gas Committee, said he had been rather amazed at the report. They might prepare the old gas-tank as a store for their excess tar, and roof in the coal-store; but it was altogether premature, he said, to bring forward at present the other proposals mentioned by Mr. Johnstone. He advocated the use of better coal, when they would have better gas. The Manager had reported the illuminating power of the gas to be 27·2 standard candles; but Mr. Tainsh said that it was oftener 20 candles, or thereabouts. Mr. Scott advocated the formation of a fund to meet probable extensions of the works; and Mr. Miller remarked that, if his proposal as to the remodelling of the accounts was adopted, there would be a provision for a reserve fund for the gas-works. Mr. Tainsh pointed out that they had reduced their debt from £27,000 to £16,000, which was a very good reserve fund. It was subsequently agreed, on the recommendation of the Gas Committee, to employ the services of Mr. Gillespie, formerly with Messrs. Laidlaw, Sons, and Caine, to make the proposed examination of the works. I may here mention that the late Mr. David Laidlaw took a very prominent part in the proceedings which eventuated in the local gas-works passing into the hands of the Town Council between twenty and thirty years ago.

In the adjacent burgh of Motherwell, a movement has been commenced which aims at the acquisition of the works of the Motherwell Gas Company. It has been reported on behalf of Mr. Jack, that he is getting well posted up with regard to the question of the Burgh Commissioners taking over the gas-works; but up to the present there is nothing definite to lay before them on the subject.

The Glasgow pig-iron market has been quiet during the past week; and there has been only one transaction in Scotch warrants, at 47s. per ton cash, at which there were, as usual, buyers at the close yesterday afternoon. Rather a larger amount of business than usual has been done in Cleveland and hematite iron warrants, the fluctuations for the former ranging from 38s. 6d. to 38s. 2½d. per ton, and for the latter

between 48s. and 47s. 6d.—the prices at the close yesterday afternoon being respectively 38s. 5d. and 47s. 7d. per ton cash.

An increased business in the Glasgow coal trade has been reported this week; and prices for prompt delivery are decidedly firm, more especially in the shipping branch. Splint coal is getting into extensive demand for gas-works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 5.

Sulphate of Ammonia.—There is very little change in the market; and quotations remain unaltered. There is, however, more disposition to buy on the part of consumers; and a fair amount of business has been done both for the home trade and for export. There can be no question that sulphate at the present extremely low rates is worth stocking for both chemical and manure purposes. There is now very little doing for future delivery, as makers decline to sell; and the dealers are not prepared to run further risks—values being so low. Nitrate remains steady at 9s. 3d. per cwt.

LONDON, *Dec.* 5.

Tar Products.—Business all round continues very flat; no one seems to have any heart for buying as prices grow weaker every day. There is an exceptional dulness in the creosote and common oils market; country makes being offered at prices at which it would pay the distillers better to burn as fuel. Pitch is the only product that may be said to be moderately firm. No business appears to be doing in anthracene; and prices quoted are nominal. The outlet for benzol at the moment appears to be closed; and were it not that makers have heavy contracts, and have in many cases oversold, the position of this article would be worse than it looks. The lower price of products is seriously affecting the value of tar, which has fallen during the year nearly 10s. per ton. Current prices are: Tar, 20s. to 23s. Pitch, 34s. Benzol, 90's, 3s. 2d.; 50's, 2s. 2d. Toluol, 1s. 5d. Solvent naphtha, 1s. 4d. Crude naphtha, 1s. 1½d. Creosote, 1d. Cresol, 7½d. Carbolic crystals, 5d.; crude, 60's, 1s. 2d. Anthracene, "A" quality, 1s. 2d.; "B," 10d.

Sulphate of Ammonia.—There is very little inquiry for sulphate; and the business that has been done during the week is at a figure lower than has been seen for many years. Sales have been reported at £9 17s. 6d. to £10 5s., less 3½ per cent.; but makers are far too anxious to sell, and thus play into the hands of depressing operators. There does not appear to be much hope of any immediate improvement in price, as the make just now is very large, and stocks are accumulating.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

A general absence of that briskness of demand which is usually expected at this season of the year, is noticeable throughout the coal trade of the district. The better qualities, suitable for house-fire purposes, are still moving away only moderately; and instead of an upward movement in prices, which would ordinarily have taken place this month, the maximum rates in some instances are barely being maintained. At the pit mouth best Wigan Arley does not now average more than 12s. 6d. per ton, 13s. being got only in very exceptional cases. Pemberton 4 feet and second qualities of Arley range from 10s. 6d. to 11s.; and common house-fire coals, 9s. to 9s. 6d. per ton. Common round coals also continue in but slow request so far as inland requirements for iron making, steam, and general manufacturing purposes are concerned; and prices are weak owing to competition of surplus supplies in the market—8s. to 8s. 6d. being the full quotations for good qualities of steam and forge coals at the pit mouth. For shipment, there is a fairly active demand; and a considerable business is being done. But prices show no improvement; and ordinary descriptions of steam coal can be readily bought at 9s. 6d. to 10s. per ton, delivered at the ports on the Mersey. Supplies of engine fuel continue far in excess of requirements; and at many of the collieries, large quantities of slack have accumulated under load, with the result that sales are pushed at very low figures, whilst the outlook for the future is anything but encouraging. At the pit mouth, ordinary descriptions of burgy average 5s. 9d. to 6s. 3d.; best slack, 5s. to 5s. 6d.; good qualities, 4s. to 4s. 6d.; and common sorts, about 3s. per ton.

Northern Coal Trade.—There has been a weaker tone in the Northern coal trade during the last few days; because the end of the strike in France has made coal a little more plentiful for the ordinary markets. Best Northumberland steam coal has been well sold forward, however; and thus most of the collieries have much work in hand for a week or so, if the tonnage for carrying comes duly to port. The price may be given as averaging about 10s. 3d.; but there are sales both above and below that price. Second-class steam and small steam are weaker—the latter because of its larger production. Gas coal is now being shipped in very large quantities, not only to the London market, but also to the Mediterranean ports—steamers being now more plentiful than they were at the time of the strike. The local consumption of gas coal is very large just now; and it is so without much fog to increase the day use. The rates for best Durham gas coal may be put at from 9s. to 9s. 6d., though one or two collieries ask a rather higher price. Bunker coal is a little lower in price—from 8s. 3d. up to 10s. being asked for the unscreened qualities, and up to 11s. 9d. for the best screened. Manufacturing coal is rather dull. In coke, there has been little variation; best blast furnace coke being quoted 15s. 6d. to 16s., f.o.b. Gas coke has been sold on contract over next year at about 10s. per ton, but only in a limited quantity

Grand Junction Water Company.—In the report of the Directors of this Company for the six months ending Sept. 30 last, dividends at the rates of 8 per cent. per annum on the ordinary share capital, 7½ per cent. on the "C" stock, and 7 per cent. on the new ordinary £5 shares, are recommended.

Failure of the Electric Light at Eastbourne.—A few nights since, the whole of the Esplanade at Eastbourne was plunged in darkness by the failure of the electric lights, which remained extinguished for the rest of the evening.

The Cantreff Water-Works of the Cardiff Corporation.—Owing to the continued and serious indisposition of Mr. Jones, who was appointed Resident Manager of the reservoir works at Cantreff, when the Cardiff Corporation became their own contractors in June last, the Water Committee have resolved to recommend the Town Council to appoint Mr. Orton, the Chief Assistant to Mr. J. A. B. Williams, the Water Engineer, to the position at a salary of £400 per annum.

Fatal Explosion at Knightsbridge.—Shortly after noon on Friday, Albert Gate Mansions (a large building in the course of construction, belonging to Mr. J. Charlton Humphreys, at Knightsbridge) was the scene of a serious gas explosion, which resulted in injury to four persons. About the time mentioned, one of the workmen engaged on the building was seeking for an escape of gas with a naked light on the ground floor, when there was a tremendous explosion, which had the effect of completely wrecking the five rooms on the first floor. Four men who were at work underneath, were so severely injured by the falling plaster, bricks, and glass, that they had to be conveyed in cabs to St. George's Hospital. Three of them—named Kirkman, Davidson, and Bellinger—were very seriously injured; and the first-named died on Saturday at the hospital.

Bideford Gas Supply.—The increasing demand for gas at Bideford has made it necessary for the Directors of the Gas Company to consider the question of enlarging their works; and they have determined to apply to the Board of Trade for a Provisional Order to empower them, among other things, to raise £6000 of new capital for the purpose. The subject has been seriously debated by the inhabitants generally; and there seems to be a general opinion that it would be injurious to the best interest of the town to allow the Order to pass unchallenged. The Company declare that they have always treated the town with every consideration; and that there is no likelihood of any exceptional powers being abused. They also claim that their gas is cheaper than in neighbouring towns; the price now paid being 4s. per 1000 cubic feet, with a sliding scale of discounts, under which even the smallest consumer gets an allowance of 10 per cent. The Town Council have decided to oppose the Order; but they have also instructed their Clerk to inquire of the Gas Company the price they would take for their property.

Charge of Embezzlement against a Gas Stoker.—At the West Ham Police Court on Monday last week, William Leeson, a Branch Secretary of the National Union of Gas Stokers and General Labourers of Great Britain and Ireland, was summoned, before Mr. Baggallay, to answer a charge of embezzling various amounts of money received by him for and on account of the Union. Mr. Sharman prosecuted. It was stated that the defendant should enter all payments made by him in contribution-books, and pay them over to the General Secretary. When the accounts of the Kensal Green branch were gone into, some considerable deficiencies were said to have been found. The defendant afterwards agreed to pay back a sum of money at the rate of 5s. per week; and he signed an agreement, with the amount left blank, to this effect. Mr. Baggallay examined the documents and the books. He said there were one or two instances where the defendant had paid in money, but had not credited himself with the amounts. The defendant said he had to receive the money from the men while at work or anywhere. After considerable argument, the defendant was discharged; but at the same time the Magistrate suggested that a fresh information should be laid. It was stated that this course would be adopted.

The Water Scheme for Bridgnorth.—At a meeting of the Bridgnorth Town Council last Tuesday, the Water Committee reported that, in accordance with the instructions received at a previous meeting of the Council, they had obtained samples of water from the Criddon Brook and Spring, and had submitted the same for analysis to the County Analyst, who had given satisfactory results in each case. The probable cost of the proposed water undertaking would be nearly double the original estimate of £10,000; and the items the proposed scheme would involve necessitated an increased expenditure of £432. Taking these figures into consideration, the Committee were of opinion that it would be unwise to spend such a large sum of money in providing a further water supply for the town, if the present supply could be rendered satisfactory. They therefore asked the Council to reconsider the question before incurring the cost of the engineers' preliminary survey and report; and if the Council should decide to abandon the proposed gravitation scheme for the present, they recommended that the question of rendering the existing filter-beds thoroughly efficient, and of otherwise improving the present supply, should be entered upon without delay. The report was ultimately adopted.

The Hours and Wages of Gas Workers at Halifax.—The Halifax Corporation Gas Committee have received a letter from the Secretary of the Gas Workers Union, claiming on behalf of the men employed at the gas-works a reduction in the hours of labour, an increase in the rate of wages, and other privileges. The Gas Committee decided, before replying, to confer with the Corporations of Leeds, Bradford, and Huddersfield; and a conference was held at the Town Hall, Halifax, last Wednesday week, when the following gentlemen were present: From Leeds, Alderman Gilston, the Chairman of the Gas Committee, Mr. Councillor Lupton, and the Gas Engineer; from Bradford, the Gas Engineer and his Deputy; from Huddersfield, the Chairman of the Gas Committee (Mr. Stocks), the Town Clerk, the Gas Manager, and his assistant; and for Halifax, the Mayor, the Chairman of the Gas Committee (Mr. Brook), the Town Clerk, and the Gas Engineer. The proceedings were private; but the meeting was quite unanimous as to what should be conceded and what resisted. At a meeting of the Halifax Gas Committee on the following Friday, it was decided to ask the gas workers to appoint a deputation to confer with a deputation from the Committee, with a view to a settlement of the matters in dispute. The interview took place during the past week, but no definite result was arrived at; and the questions were deferred to a future meeting.

The London County Council and Public Health.—The Public Health (London) Act, 1891, which comes into force on the 1st of January next, confers or imposes a number of new powers and obligations upon the London County Council. These have been dealt with in an elaborate report by the General Purposes Committee (of which the late Mr. Haggis was acting Chairman), which came before the Council at their meeting last Tuesday. One of the Committee's recommendations is that a Public Health Department shall be formed under the direction of the Medical Officer of Health of the Council, who is to have two assistants, and a staff of inspectors and clerks. A Public Control Committee is to be formed for (among other things) the execution of the powers of the Council under the Weights and Measures Acts, the Petroleum Acts, and the Acts relating to the testing of gas and gas-meters; also for dealing with all questions having reference to providing a constant supply of water under the Metropolis Water Act, 1871, and to carrying out the provisions of the Public Health Act which relate to the prevention of nuisance from smoke, as well as other matters of control of a cognate nature.

Opening of a Reading-Room at the Carlisle Gas-Works.—In connection with an extension of the purifying plant at the Carlisle Corporation Gas-Works, a new purifier-house has been erected; and the services of the builders who were carrying out the work were lately utilized to convert an old tank-house into a new hall to be used by the workmen for reading and recreation. The result of their labours has been the production of a handsome and well-lighted room, which was formally opened by the Mayor (Mr. Benjamin Scott, J.P.) last Thursday evening, in the presence of the Chairman of the Gas Committee (Mr. R. Forster) and other members and friends. In declaring the room open, the Mayor expressed the hope that gentlemen would send books from their shelves at home. Mr. J. Hepworth, M. Inst. C. E., the Gas and Water Engineer of the Corporation (who has presented about 200 volumes to form the nucleus of a library), moved a vote of thanks to the Mayor and the Chairman; remarking that the room could not have been built had it not been for the support given to the project by the Gas Committee. The motion was cordially adopted; and subsequently a musical entertainment was given.

The Projected Amalgamation of the Willenhall and Bilston Gas Companies.—In connection with this matter, a letter was read at the last meeting of the Bilston Commissioners, from the Manager of the Bilston Gas Company (Mr. J. S. Reeves), in which he said that his Directors would be glad to know at an early date if the Commissioners saw any objection to the proposal. He also mentioned that it was in contemplation to manufacture the whole of the gas required at the Bilston works—an arrangement which, it was believed, would tend to cheapen the price to the whole of the district supplied. After reading the letter, the Clerk stated that at the present time the Commissioners had power to acquire the gas-works; and, if the amalgamation took place, they would be at a disadvantage in having to pay more money if at any time they would desire to make the purchase. The Board, if they wished, had good ground for opposition. The matter was referred to the General Purposes Committee. On the subject being brought before the Willenhall Local Board, they decided to discuss it in private, as "there would be delicate questions to be considered." The shareholders of the Bilston Gas Company have met together, and passed a resolution sanctioning the action of the Directors.

Sales of Stock and Shares.—At the Auction Mart, Tokenhouse Yard, E.C., last Wednesday, Messrs. Edwin Fox and Bousfield offered for sale by auction eleven £100 new shares (fully paid) in the *New River Company*, which realized prices ranging from £341 to £336 per share; and twenty-five £10 shares (fully paid) in the *Notting Hill Electric Light Company*, which were knocked down at £8 15s. each.—— On the same day, Messrs. G. Nichols, Son, and Alder offered for sale at Bristol £20,000 of new 4 per cent. debenture stock of the *Bristol Gas Company*. The sale attracted a large attendance; and, on the whole, the bidding was very spirited. The stock was sold in lots of £100; and the prices realized were as follows: Fourteen lots were disposed of at £107; six lots, at £106 15s.; six lots, at £106 10s.; one lot, at £106; ten lots, at £105 15s.; 46 lots, at £105 10s.; two lots, at £105 5s.; 13 lots, at £105; one lot, at £104 10s.; five lots, at £104; six lots, at £103; two lots, at £102 10s.; 30 lots, at £102 5s.; and 58 lots, at £102. The total amount produced by the sale was £20,800 10s.—— A quantity of the new 7 per cent. stock to the nominal value of £38,100 issued by the *Liverpool United Gaslight Company*, was sold at Liverpool last Tuesday, by Messrs. Branch and Leete. The prices paid ranged between £142 and £151 per cent.; the total amount realized by the sale being about £54,300.

The Letting of Gas Cooking-Stoves on Hire at Wallasey.—On the minutes of the Gas and Water Committee coming before the Wallasey Local Board at their meeting last Thursday, Mr. Joyce alluded to the letting of gas-stoves on hire, and questioned whether this was a profitable enterprise. While the consumption of gas in the district was increasing, the profits, he said, had diminished to such an extent that they were threatened with the gas-works becoming a positive burden to the district. Last year they sold £18,000 worth of gas, but the profit was only £900; whereas the previous year the profit was £4000. This was certainly a most serious question, when they bore in mind that the district was threatened with an extension of the gas-works to cost £100,000. He thought the Board should hesitate and thoroughly sift this matter, and ascertain if they were really doing wisely in resisting the introduction to the district of the electric light. He hoped the Gas Committee would give more attention to the affairs of their department, and explain why their profits diminished from year to year. The Chairman (Mr. Steel) did not think it quite fair that any reflection should be cast on the Gas Committee. He considered all the Committees did their work extremely well. With regard to the decrease of profit, this was caused by the increased price they had to pay for coal and cannel, and increased wages to workmen. Mr. Heap moved an amendment that no more gas-stoves be purchased by the Board either for sale or hire. After considerable discussion, the amendment was lost; and a resolution of the Gas Committee was approved "—That no more gas cooking-stoves be ordered unless they were purchased absolutely by the consumers."

The Proposed Acquisition of the Belper Water-Works by the Local Board.—Reference was made in the JOURNAL for Nov. 24 to the resolution passed at a meeting of ratepayers at Belper, that the Local Board should take steps to acquire the undertaking of the Belper Water Company, at a fair valuation, and improve the supply. At the recent monthly meeting of the Board, it was announced that the Company had abandoned their intended application to Parliament for powers to borrow £4000 for extending their storeage; and therefore it remained for the Board to decide what should be done. A proposition was submitted to the effect that, before any action was taken to acquire the Company's property, the householders should be circularized, with the view of ascertaining their opinion on the question. This course was unanimously agreed to.

The Pollution of Town Air by Smoke.—On Monday evening last week, Mr. John Holliday (Mr. Hepworth's assistant at the Carlisle Gas-Works) read a paper on the above subject to the members of the Carlisle Scientific Society. He first gave a short history of the smoke abatement movement, and said that as early as 1306 Parliament had the question under consideration. He reminded his hearers of the formation of the Smoke Abatement Institution and the holding of the Smoke Abatement Exhibition in 1881; and he went on to say that the domestic hearth is the chief offender in the matter of aggravating town fogs. In burning coal pure and simple in an open grate, 42 per cent. of the heat generated passes away directly up the chimney, without being in any way utilized in warming the room. With coal and a proportion of broken coke, a good, smokeless fire might be made to last from six to eight hours for the cost of 1d. The effects produced by the emission of black smoke, upon the health of cities and towns, was next dealt with; and Mr. Holliday said that even in Carlisle the destructive sulphur compounds were often to be found, as shown by the result of a test lately made with Carlisle air during a fog. He recommended the use of gaseous fuel for domestic purpose as the best present solution of the smoke nuisance. He believed with Sir F. Leighton, as expressed in a speech delivered a short time since at the Mansion House, that "if each individual would say, 'My fireplace shall no longer smoke,' the millennium would have come."

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1034.)

Issue.	Share	When ex-Dividend.	Last Dividend. (Half-year.)	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	15½–16½	..	6 7 3
100,000	10	,,	7½	Do. 7 p. c.	10	11–12	..	6 5 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	106–108	..	4 12 7
100,000	20	27 Nov.	8	Bahia, Limited	20	12–14*	..	11 8 6
200,000	5	12 Nov.	7½	Bombay, Limited	5	6½–6¾	..	5 11 1
40,000	5	,,	7½	Do. New	4	4¾–5¼	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	210–220	..	5 11 4
125,000	,,	,,	9½	Do. New	100	157–162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40–42	..	5 9 6
888,500	Stck.	16 Sept.	5	Bristol	100	103–105	..	4 15 3
320,000	20	15 Oct.	11½	British	20	42–44	..	5 2 3
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18–20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13–15	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	6–7	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	92–96	..	6 5 0
150,000	20	13 Aug.	8	Cagliari, Limited	20	24–26	..	6 3 1
550,000	Stck.	15 Oct.	13½	Commercial, Old Stock	100	240–250	..	5 10 0
161,396	,,	,,	10½	Do. New do.	100	185–195	..	5 10 3
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119–124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	215–225	..	4 8 10
200,000	,,	,,	7	Do. 7 p. c. Pref	100	190–200	..	3 10 0
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	190–200	..	5 0 0
480,090	10	15 July	10	European, Limited	10	19–20	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	14–15	..	5 0 0
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	224–229	+6	5 13 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94–97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	248–253	–2	3 19 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118–123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172–177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	157–161	+1½	4 6 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	245–250	–4	4 0 0
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	145–155	..	3 17 0
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112–115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120–125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163–168	..	3 11 5
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	214–219	+1	5 9 7
75,000	5	26 June	5	Malta & Mediterranean, Ltd.	5	4¾–4¾	..	6 6 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109–111	..	4 10 1
541,920	20	27 Nov.	6¾	Monte Video, Limited	20	15–16*	–½	8 2 6
150,000	5	27 Nov.	10	Oriental, Limited	5	8–8¼*	..	5 17 8
60,000	5	30 Sept.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2½–3½	..	—
				People's Gas of Chicago—				
420,000	100	3 Nov.	6	1st Mtg. Bds.	100	90–95	..	6 6 4
500,000	100	1 Dec.	6	2nd Do.	100	88–93*	+1	6 9 0
150,000	10	15 Oct.	10	San Paulo, Limited	10	12–13	–¼	7 13 10
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	265–275	+5	5 12 9
1,350,000	,,	,,	12	Do. B do.	100	222–226	..	5 6 3
200,000	,,	,,	13	Do. C do.	100	225–235	..	5 10 8
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	140–145	..	3 9 0
600,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	255–265	–2½	3 15 6
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	200–205	–2	3 18 0
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138–143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	103–108	–1	3 14 1
708,000	Stck.	13 Aug	10½	Kent	100	257–262	..	4 0 2
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	230–235	–1	4 0 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	192–197	..	3 16 2
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120–123	+2	3 5 0
500,000	100	13 Aug.	12½	New River, New Shares	100	330–340	–5	3 11 4
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123–126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	150–160	–5	4 1 3
126,500	100	,,	6½	Do. 7½ p. c. do.	100	150–160	–7½	4 1 3
1,155,066	Stck.	11 June	10	West Middlesex	100	245–255	..	3 18 5

*Ex div.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

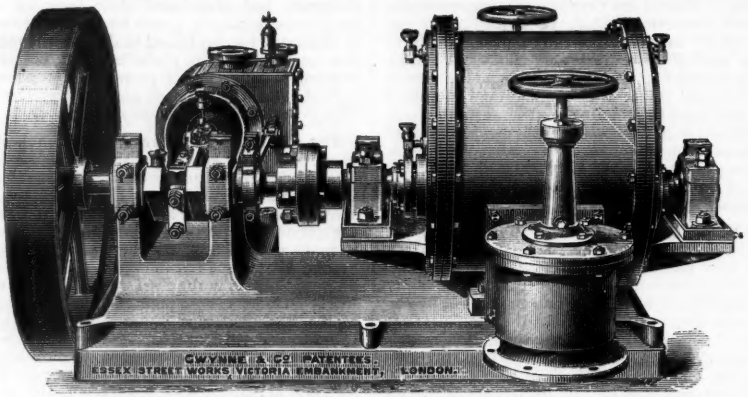
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1066 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
D. M. NELSON AND SONS, GLASGOW. Telegraphic Address: "Gas Glasgow." Depôts throughout England and Scotland.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 1063.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

OIL for the "Wells" or "Lucigen' Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

NOW READY. PRICE ONE GUINEA.

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS.

1879-1890.

Compiled by EDMUND HERBERT STEVENSON, M. Inst. C. E., F. S. I., and EDWARD KYNASTON BURSTAL, M. Inst. C. E., M. Inst. Mech. E.

This Work (which is a continuation of that published in 1879 by the late Mr. G. W. Stevenson) contains information as to the practice of Parliament during the past twelve years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings. The greatest care has been taken in its compilation; and it is arranged in a very handy form.

*** The Work by the late Mr. G. W. Stevenson is still on sale, price One Guinea.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE 173, Fentiman Road, LONDON, S.W.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

WANTED, a position in Draughtsman's Office or Laboratory in Gas-Works by a Young Gentleman just leaving School. Can have the highest recommendations.
Address No. 2045, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a respectable, sober Man as STOKER.
Apply to the GAS-WORKS, CHERTSEY.

WANTED, a useful young Man for small Gas-Works.
Apply, in own handwriting, stating wages (which must be low), to No. 2044, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF WIGAN.
(GAS DEPARTMENT).

WANTED, a Meter Inspector. Wages, 24s. per week.
Apply, with references, to JOS. TIMMINS, Engineer.

WANTED, a Gentleman to represent a Colliery Company, to push the sale of their Gas and Steam Coals in London and vicinity, having connection with Gas Companies and Shipowners.
Apply, by letter, stating age, experience, and salary expected, to No. 2043, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SCARBOROUGH GAS COMPANY.

THE Directors of this Company are prepared to receive APPLICATIONS for the Office of SUB-MANAGER at their Works.
Salary, £200 per annum.
A statement of the duties and conditions of appointment may be obtained from the undersigned, to whom applications, in the Candidate's own handwriting, accompanied by not more than three testimonials (copies only), on paper of foolscap size, should be addressed, endorsed "Sub-Manager," and must be delivered not later than Friday, the 26th of December next.

By order,
WILLIAM J. MOON,
Secretary and Manager.

Gas Offices, Scarborough,
Nov. 25, 1891.

ADVERTISER is prepared to purchase High Percentage GAS LIQUOR. Also CRUDE LIQUID AMMONIA, 15 to 20 per cent. Good price paid.
Address No. 2042, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SULPHURIC ACID.

WANTED, for Midlands, about 40 tons weekly for several weeks, non-arsenical. Delivery by Railway or Canal.
Address, stating particulars, Box 423, G.P.O., MANCHESTER.

SECOND-HAND Exhauster required, 100,000 to 200,000 cubic feet capacity per hour, for use as Air-Blower. State Maker's name, and full particulars, with lowest price. No connections or regulating fittings required.
Address No. 2046, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGLISH PATENTS FOR SALE.

TWO Patents relating to Gas-Burners FOR SALE.
These Gas-Burners are now being sold by thousands in the United States. Most of the public buildings in Washington City are fitted with them; and a large number of high testimonials have been obtained.
Address H. SPORTON AND CO., Glen Works, Chase Side, Enfield, MIDDLESEX.

OLDBURY LOCAL BOARD OF HEALTH.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the AMMONIACAL LIQUOR produced at the Gas-Works, Oldbury, delivered into Boats at the Canal Wharf of the Board, for Three or Five years, from the 31st of December, 1891.
Tenders, endorsed "Tender for Liquor," to be sent to the undersigned, on or before Tuesday, the 15th inst.

By order,
C. MEIKLEJOHN,
Manager.

Dec. 4, 1891.

OLDBURY LOCAL BOARD OF HEALTH.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the surplus TAR produced at the Gas-Works, Oldbury, delivered into Boats at the Canal Wharf of the Board, for a period of One and Three years from the 31st of December, 1891.
Quantity, about 300 tons per annum.
Tenders, endorsed "Tender for Tar," to be sent to the undersigned on or before Tuesday, the 15th inst.

By order,
C. MEIKLEJOHN,
Manager.

Dec. 4, 1891.

GLASGOW CORPORATION GAS.

TENDERS FOR GASHOLDER.

THE Gas Committee of the Glasgow Corporation are prepared to receive TENDERS for the construction of a GASHOLDER, 236 feet in diameter, at their Temple Gas-Works, near Maryhill.
Copies of Specification and Form of Tender may be obtained and Plans seen at the Engineers' Office, 45, John Street, on payment of Two guineas.
Sealed offers, marked "Tender for Gasholder," to be lodged with the subscriber, on or before the 22nd of December next.
The Committee do not bind themselves to accept the lowest or any tender.

J. D. MARWICK,
Town Clerk.

City Chambers, George Square,
Glasgow, Nov. 25, 1891.

BOROUGH OF WEST BROMWICH.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders, accompanied with Drawings and Specifications, for the construction and erection of a TWO-LIFT GASHOLDER. 120 feet diameter, at their Gas-Works, Albion, West Bromwich.
A copy of the general conditions and other information may be obtained upon application to Mr. Wm. Littlewood, the Manager of the Gas-Works.
Tenders, endorsed "Tender for Gasholder," to be delivered to me not later than Thursday, Jan. 7 next.
The Gas Committee do not bind themselves to accept the lowest or any tender.

By order,
THOS. HUDSON,
Secretary.

Secretary's Office, West Bromwich,
Nov. 21, 1891.

THE Directors of the Farnworth and Kearsley Gas Company are prepared to receive TENDERS for the sale of about 130 tons of SPENT OXIDE.
Samples may be obtained by application to the undersigned.
Tenders to be addressed to James Warburton, Esq., Chairman.

J. L. SHEPPARD, Manager.

THE Directors of the Worksop Gas Company invite TENDERS for the purchase of the surplus TAR and the AMMONIACAL LIQUOR made at their Works from the 1st of January to the 31st of December, 1892.
Tenders for the Tar to state price per ton at the Company's Works.
Tenders for Liquor to state price per ton as tested by No. 1 Twaddel's Hydrometer, also at the Company's Works.
The Directors do not bind themselves to accept the highest or any tender.
All tenders to be sent in by the 24th inst.
Worksop, Dec. 3, 1891.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS from Ironfounders, Gun-Barrel Manufacturers, Ironmongers, Timber Merchants, Druggists, Ropemakers, &c., for GOODS to be delivered on the Company's Works, Great Brunswick Street, in such quantities as may be required from time to time up to the 31st of December, 1892.
Printed lists of articles required can be had on application at the Company's Offices, D'Olier Street.
Tenders, endorsed "Tender for Stores," to be lodged in my Office on or before the 26th inst.

W. F. COTTON,
Secretary and Manager.

D'Olier Street, Dublin,
Dec. 3, 1891.

ROCHDALE CORPORATION.

TO RETORT MAKERS, ETC.

THE Gas Committee of the Corporation invite TENDERS for the supply of such quantities of FIRE-CLAY GOODS (Retorts, Bricks, &c.) as they may require during the year commencing on the 1st of January next.
Forms of tender and full particulars can be had on application to Mr. T. B. Ball, Manager, Gas-Works, Dane Street, Rochdale.
Tenders, endorsed "Fire-Clay Goods," must be sent to me not later than noon of Wednesday, the 16th of December next.

By order,
ZACH. MELLOR,
Town Clerk.

Town Hall, Rochdale,
Dec. 3, 1891.

SOUTH METROPOLITAN GAS COMPANY.

£25,000 Five per Cent. Perpetual Debenture Stock of the above Company, presenting an Investment of the soundest description.

MESSRS. G. A. WILKINSON & SON are instructed by the Directors to SELL BY AUCTION, at the Mart, on Wednesday, Dec. 16, at Two o'clock precisely, in numerous lots, to suit large and small purchasers, £25,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK of the South Metropolitan Gas Company.
The Districts supplied by the Company comprise nearly the whole of the South of London from Wandsworth to Plumstead Marshes, and the demand has so much increased that the supply of Gas has been nearly doubled within the last Ten years.
Particulars may be had of FRANK BUSH, Esq., Secretary of the Company, 709A, OLD KENT ROAD; of Messrs. BUDD, JOHNSONS, AND JECKS, Solicitors, 24, AUSTIN FRIARS; and of Messrs. G. A. WILKINSON AND SON Surveyors and Auctioneers, 7, Poultry, CITY.

PATENT SULPHATE OF AMMONIA PLANT.

C. & W. WALKER.

PATENT MURIATE OF AMMONIA PLANT.
PATENT LIQUID AMMONIA PLANT.
PATENT TAR PLANT.

Makers of the most perfect form of Apparatus for the Manufacture of Sulphate, Muriate, Liquid Ammonia and Tar Products.

Apparatus already erected have proved more economical in consumption of Fuel, Simplicity, and Cheapness of Working than any known Plant.

Sole Makers of Claus' Patent

SULPHUR RECOVERY PLANT

for recovering Sulphur from Waste Gases containing Sulphuretted Hydrogen.

Testimonials & Estimates on Application.

8, FINSBURY CIRCUS, LONDON, E.C.; MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

WANTED, for the Installation of a second Tar-Works in the Netherlands, a CAPITAL of £25,000.
The only existing Company made in 19 years a net profit of 1100 per cent.
Information will be given by TH. SMIT, Hemony-street, 43, AMSTERDAM.

NEW ROMNEY GASLIGHT AND COKE COMPANY, LIMITED.

THE Directors of the above Company have FOR DISPOSAL the REMAINDER of the Issue of 400 SHARES—viz., 84 Shares of £5 each.
Applications for such Shares at par to be made on or before the 28th inst., to
WM. ALLEN, Secretary.
New Romney, Kent,
Nov. 14, 1891.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS in respect to the Debenture Stock only WILL BE CLOSED on the 18th of December inst., and re-opened on the 1st day of January, 1892.
By order,
I. A. CROOKENDEN,
Secretary.
St. Helen's Place, London,
Dec. 4, 1891.

RE BECK GAS-ENGINE COMPANY, LIMITED.
IN LIQUIDATION.

THE Valuable Stock of New and Exhibition ENGINES, ranging from 1 to 16 horse power, as well as the various Finished Duplicate and other parts, also the BRITISH and COLONIAL PATENTS, and the DESIGNS, PATTERNS, and DRAWINGS connected therewith, will be SOLD BY PUBLIC AUCTION, at the County Hotel, Newcastle-upon-Tyne, on Wednesday, Dec. 9, at Two p.m., in one lot, or if not so disposed of, then in lots to suit buyers.
The Engines, Duplicate Parts, and Patterns can be inspected at the Works of Messrs. BLACK, HAWTHORN, AND CO., GATESHEAD-ON-TYNE; whilst particulars relating to the Patents and Drawings can be obtained from Messrs. SNOWBALL AND CO., Mechanical Valuers, &c., Crown Chambers, Side, NEWCASTLE-UPON-TYNE.
Applications for List of Engines, &c., may be made to them, or to W. B. PEAT, Esq., the Liquidator, 3, Lothbury, LONDON, E.C.

By order of the Executors of the late J. J. Stevens, Esq.—465 £10 shares in the West Kent Gas Company, and 84 £10 shares in the Mitcham and Wimbledon District Gaslight Company, both paying 10 per cent. Dividends; all fully paid and first issue, in numerous lots.

MESSRS. BROAD AND WILTSHIRE will SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Friday, Dec. 18, 1891, at Two o'clock precisely, 465 FULLY-PAID £10 SHARES in the West Kent Gas Company, the Works of which are situate at Erith and Crayford in Kent; also 84 FULLY-PAID £10 SHARES in the Mitcham and Wimbledon District Gaslight Company, whose Works are at Mitcham.
Both Companies pay Dividends of 10 per cent. They supply large and rapidly increasing Districts; and their Shares may be considered as offering to the public a thoroughly sound investment.
Particulars at the MART; of J. J. KEILY, Esq., Solicitor, 366, GOSWELL ROAD, E.C.; or of the AUCTIONEERS, 7, Queen Street, CHEAPSIDE, E.C.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

PATENTS FOR INVENTIONS,
REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.
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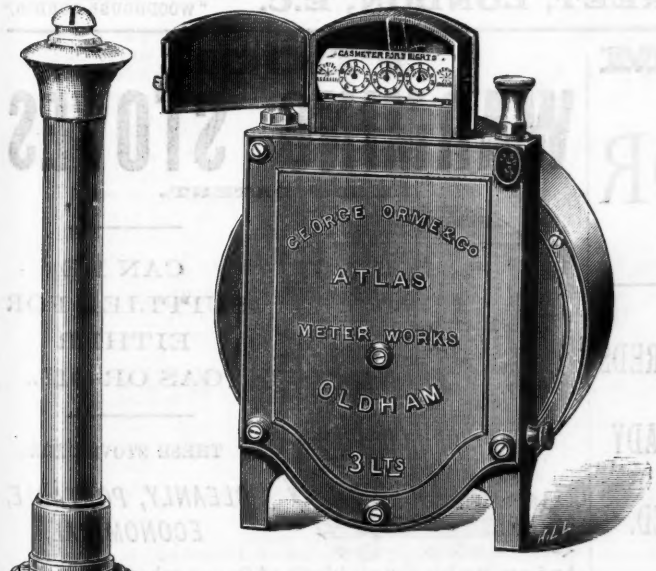

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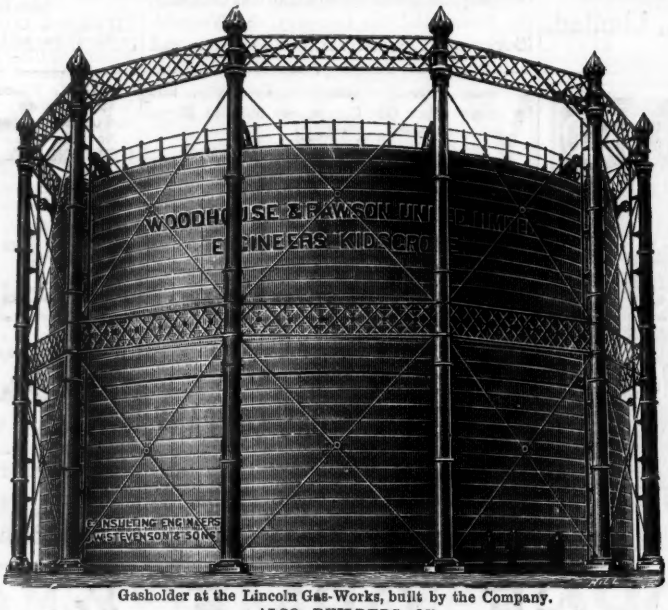

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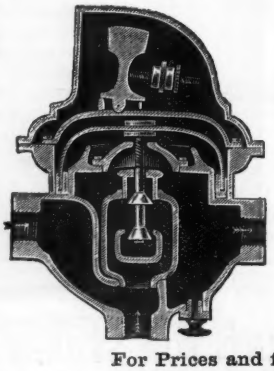

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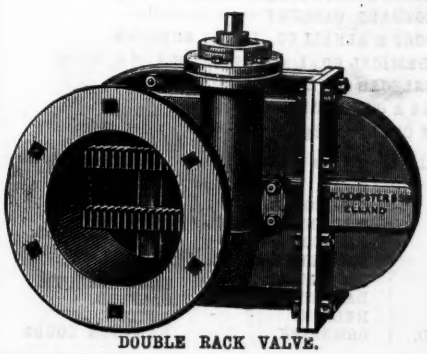

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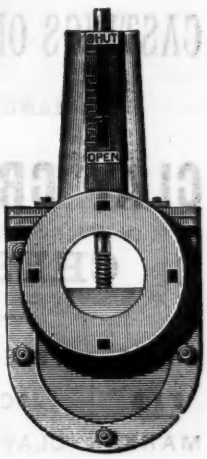

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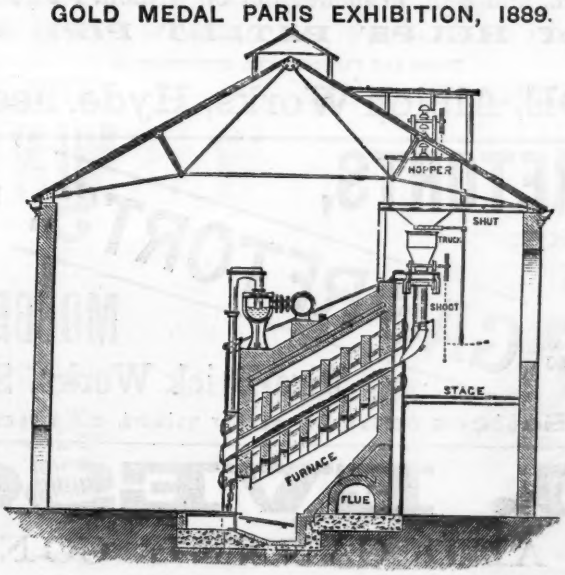

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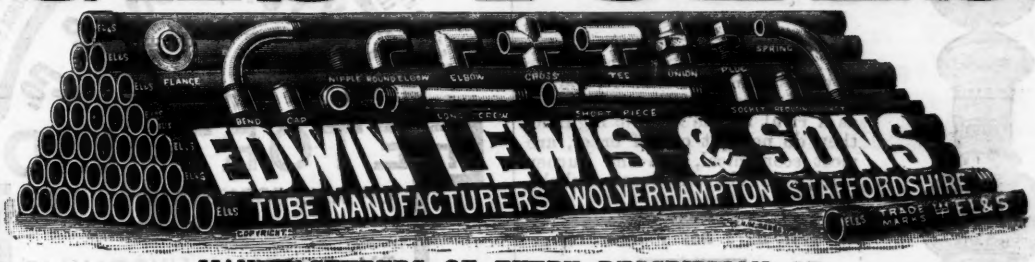

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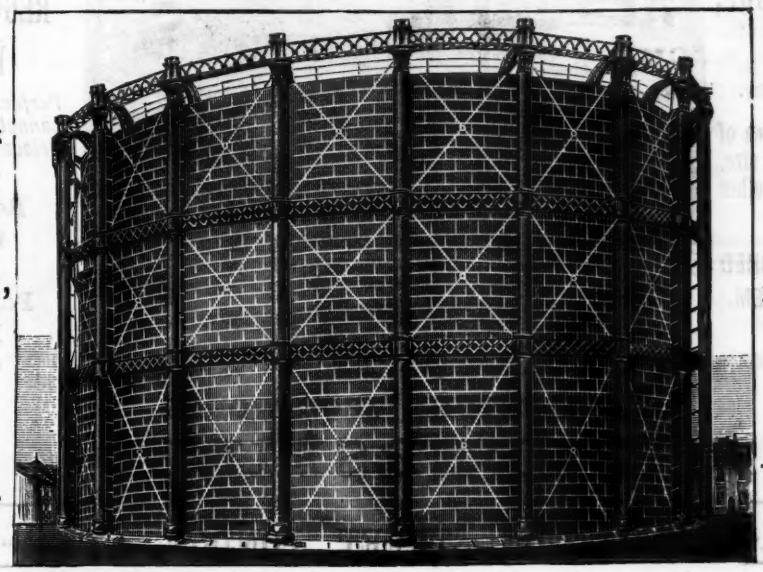

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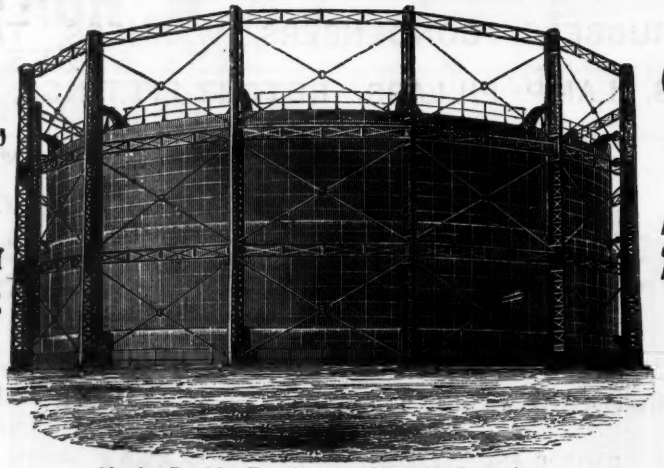

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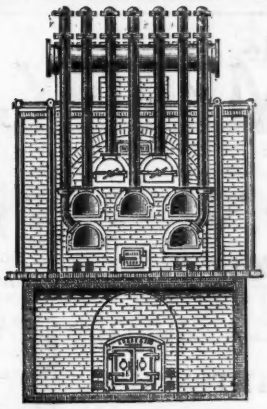

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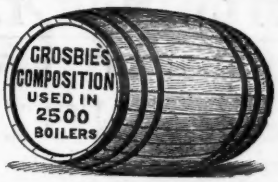

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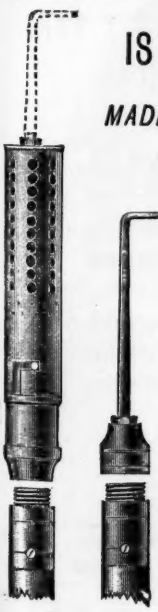

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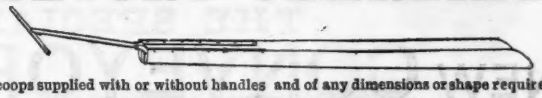

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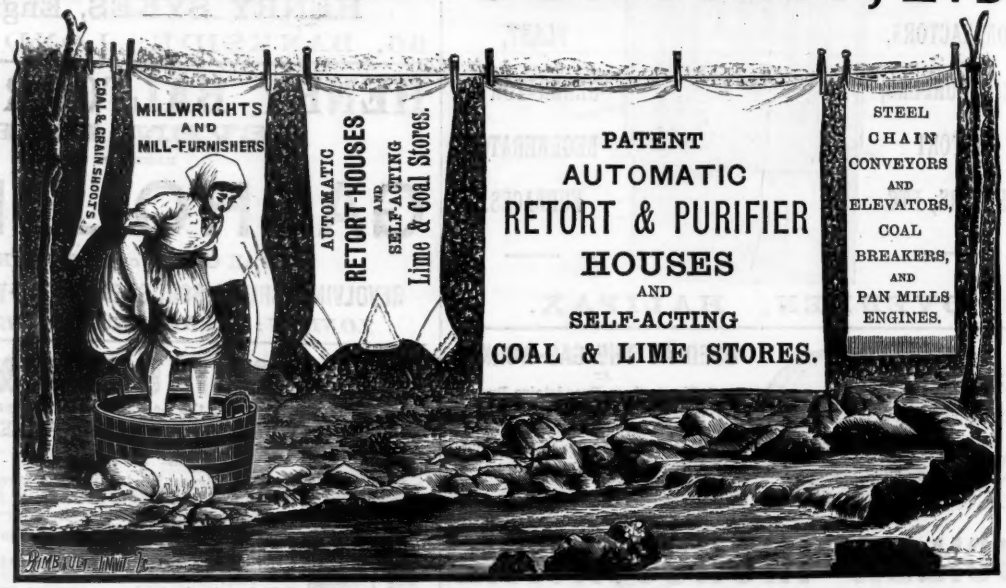
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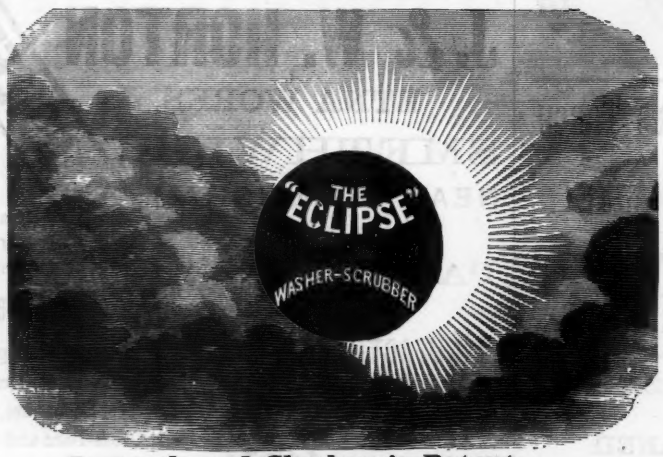

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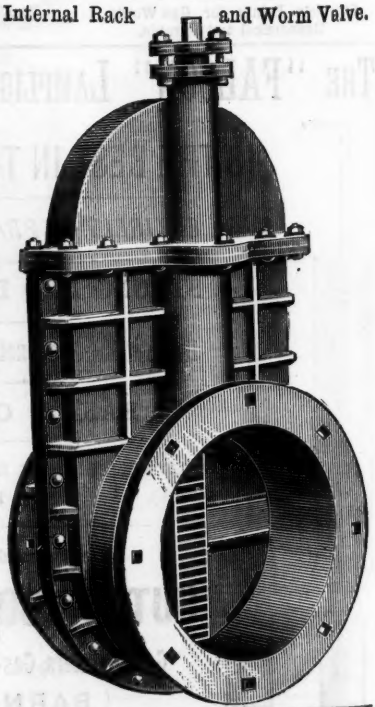

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